UDC 631.22

IMPROVEMENT DISTRICT HEATING SYSTEM USING VACUUM GREENHOUSES HELIOCOLLECTOR

VA Lazorenko, Ph.D.

Results of development of the system of hotbrining of hothouses with using of vacuum geliocollector and results of investigation of their energy efficiency with using of heatcover screens for the combined aquatic and sunny heating are considerated. Economic effect of applying results in industry is certain/ It ia a coefficient of substitution warm loading.

Hothouse, vacuum geliocollector, hotbrining, thermal resistance, energy efficiency, coefficient of substitution warm loading, blind.

The main problem of off-season vegetables - high cost due to significant cost savings. In the cost structure of vegetable production in greenhouses share of energy consumption reaches 60%.

During the period of rising energy prices and unpredictable fluctuations especially urgent energy conservation, which involves a lot of factors that reduce energy consumption and thereby reduce their share in the cost of agricultural production.

The development of modern technologies vegetable identify several basic and auxiliary fields. One of these areas is considering optimization of heating and ventilation systems in multivariate environment greenhouses. Compromise solution on this issue may be to minimize energy consumption while maintaining profitability. According to the norms of technological design ONTP-SH-10-81 systems engineering microclimate in greenhouses to maintain the internal air temperature of 15-18 to 26-30 ° C, relative humidity 60 to 95%, soil temperature - 18 to 26 ° C, depending on the culture, grown in greenhouse structures, and the period of vegetation. Create the desired temperature (18-26 ° C) at a depth of 0.2-0.3 m, ie in the area of the roots, due to internal thermal treatment facilities is

difficult and economically impractical because it would require raising the air temperature in the greenhouse and increase heat loss through the fence by 10-20%. When doing intensive agriculture in greenhouses energy is several times higher than costs in the production of vegetables in the open field. Studies [1,2] have shown that the unit external energy expended in protected storage is provided only 0,02 biological energy. Thus, the modern greenhouse agriculture, which is highly mechanized production, the energy relation ineffective. Improvement of thermal plants cultivation is carried out today in the following areas: improvement of design solutions greenhouses, creating more effective in technical and economic terms, heating systems, renewable energy and waste energy.

The priority that determines the efficiency of vegetable production in greenhouses in modern terms, an active energy-saving policy of enterprises based on the use of intensive technologies of vegetable crops. This determines the relevance of this research topic.

The purpose of research - improving heat greenhouses using conventional water heating and renewable - through the use of solar vacuum collectors and determine its efficiency.

Materials and methods research. Greenhouses are among the largest consumers of thermal energy is therefore appropriate to focus on creating energy efficient systems that do not require large energy consumption of primary energy resources and yet can provide heat to the greenhouse during the cold season. It is advisable to use solar energy to heat water using solar collectors for technology and consumer needs as well as to heat the coolant that circulates in the system of water heating and direct heating medium in the greenhouse structures.

Configure energy-saving technology of their production to the rational use of heat during computer "aided control its costs, which leads to the creation of reliable optimal microclimate and, consequently, makes it possible to increase the yield of greenhouse crops and improve their quality.

Known greenhouse [3] for growing seedlings and greenhouse crops in buildings with artificial climate. A partial solution of the problem is achieved by a

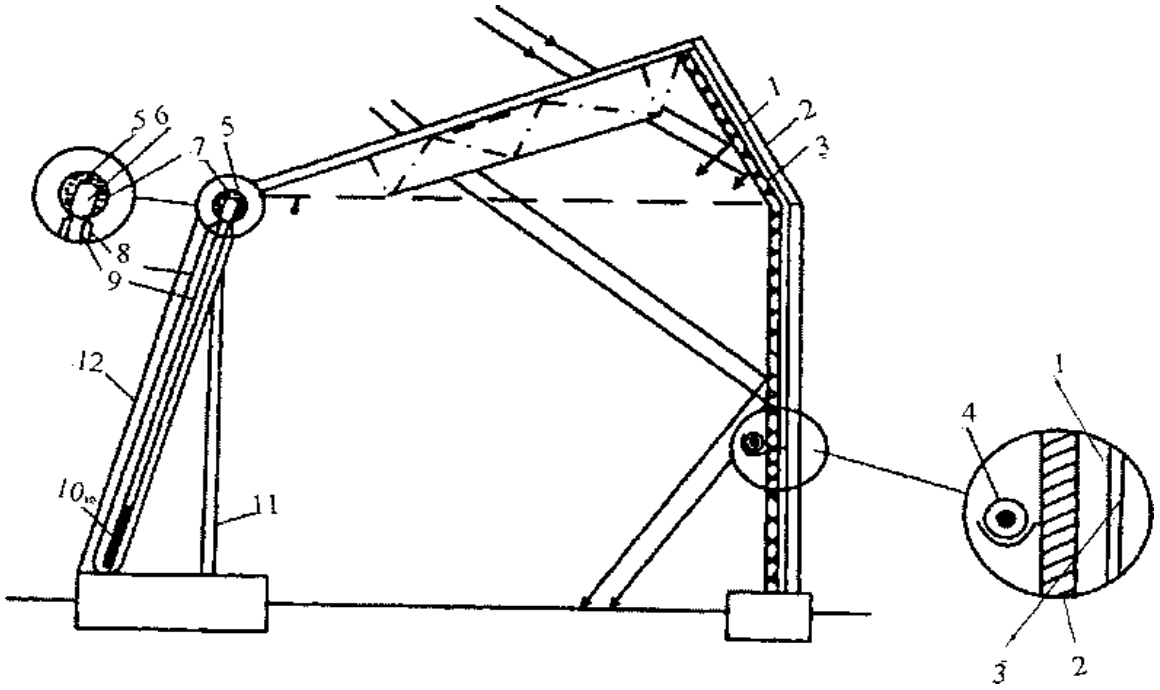
more efficient use of solar energy on the south side of the vertical walling to the level of under-roof trusses installed solar system with vacuum solar collectors at an angle relative to the horizon depending on the latitude areas, where installed solar system. External pipe solar collector made of hardened barosylikatnoho glass is transparent, so sunlight through glass heated inner tube solar collector as well as the environment in the greenhouse. Inner tube made of a material having a high thermal conductivity and covered with high quality selective coating which ensures absorption of more than 90% of radiative energy from the sun at a minimum reflektsiyi (reflection), partially filled with non-toxic organic liquid with a boiling point below -30 0C. Between the outer and inner tubes - vacuum, allowing the transfer of heat by convection and conduction visutniy and, consequently, the loss of heat regardless of the ambient temperature is negligible.

The disadvantage of this design greenhouses is that cold air due to infiltration enters the greenhouse through the elements of compounds conyachnyh collectors which affects the temperature and humidity conditions in the greenhouse. In addition, there is a scattered radiation heat flux is due to the reflected thermal radiation from the thermal screens, soil and other surfaces towards the direction with greenhouse "through transparent vacuum collectors items. Thus decreasing the efficiency of solar systems, which require additional inputs of energy resources (FER).

Improvement of heat [4] would reduce heat losses, which have entered the greenhouse through the water heating and solar radiation. This is achieved by the fact that on the south side of the vertical walling to the level of under-roof trusses installed with translucent shade, wind - and waterproof layer that transmits heat and optical radiation with selective coating on the inner surface, which reflects infrared radiation in the greenhouse, directed, of the greenhouse. " It formed three-layer envelope: curtain - a layer of air - vacuum solar collector, thermal resistance to heat transfer in which heat transfer, including radiative heat flux from soil and radiation environment greenhouses increased to 2,0-2,3 m2K/Vt. At the same time outside the thermal and optical radiation passes smoothly, and the flow of cold air through

infiltration decreases to almost 0.

General view of energy-saving greenhouse is shown in Fig. The design work on the program, which depend on the culture and maintains the necessary microclimate parameters throughout the process of growing plants.



Hothouse energy saving:

1 - Special design of curved sections, 2 - sontsepronyknyy slope envelope, 3 - a heat screen, 4 - tube tent heating, 5 - Distribution of water heating collector, 6 - upper inner tube vacuum heliocollector - capacitor 7 - coolant that circulates in the heating greenhouses, 8 - transparent outer tube of hardened glass barosylikatnoho 9 - inner tube, made of material having high thermal conductivity and covered with high quality selective coating, 10 - an organic liquid having a boiling point below -30 ^{0}C, 11 - support 12 – Blind

Heat treatment provided by a combined heating system, which includes the use of traditional energy sources and renewable with vacuum solar collectors. Regulation of microclimate, coolant flow, control irrigation, mineral nutrition, elektrodoosvitlennya seedlings in office, feeding carbon dioxide by the computer system controlling the microclimate. Excess heat is used to heat water in the battery technology and heat for domestic use.

When installing a translucent curtains, wind and waterproof layer with selective coating on the inner surface of the thermal and optical radiation passes without outside interference, while the heat transfer in the direction of increasing greenhouse thermal resistance of the surface enclosing the greenhouse. The total heat loss through this surface are reduced by 7 %, and the replacement of the thermal load on the acquisition of vacuum collectors 97 % of radiative energy from the sun and even reflektsiyi 3-7% increases from 0.58 to 0.62, indicating that the energy efficiency of heating greenhouses and reduce production costs.

Conclusions

1. Improvement of heating system of greenhouses using conventional water heating and renewable - solar vacuum collectors by establishing a translucent curtains, wind and waterproof layer with selective coating on the inner surface.

2. Moving in the direction of heat, with greenhouses "NSC framework increases the thermal resistance of the surface of the greenhouse to 2,0-2.3 m2K/Vt. The total heat loss through this surface are reduced by 7 %.

3. Definitely the replacement heat ¬ local load (percentage of solar energy in covering up load) that the absorption of vacuum collectors 97% emissivity and solar reflektsiyi 3-7 % level is 0.62, which characterizes the energy efficiency of heating greenhouses.

References

1.Волеваха М. М. Енергетичні ресурси клімату України / М. М.Волеваха, М.І.Гойса — К.: Наук. думка, 1967.— 132 с.

2. Корчемний М.О., Енергозбереження в агропромисловому комплексі. /Корчемний М.О., Федорейко В.М, Щербань В.А. – Тернопіль: Підручники і посібники, 2001. – 984 с.

3.Пат.№ 65560 Україна, МПК AO1G 9/00. Геліотеплиця /Лазоренко В.О.; власник Національний університет біоресурсів і природокористування України № u 2011006025; заявл. 9.07.2009; опубл. 12.12.2011, Бюл.№23.

4.Пат.№ 70793 Україна, МПК AO1G 9/00. Теплиця енергозберігаюча /Лазоренко В.О.; власник Національний університет біоресурсів і природокористування України –№ u2011 14538; заявл. 7.12..2011; опубл. 25.06.2012, Бюл.№12.