WAY TO REMOVE SNOW FROM THE SURFACE OF OPTICALLY TRANSPARENT GREENHOUSES ROOFS USING THERMAL RADIATION

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A method of cleaning a roof greenhouses with effective insulation of snow through thermal radiation. An analysis of the proposed solutions and ways to improve mood.

Greenhouses, snow removal, radiation energy.

For greenhouses Ukraine a significant percentage of the cost of production is in energy, due to the climate of our country, where the heating season can last up to 5 months. In terms of the rising cost of electricity and natural gas domestic enterprises have been widely used European experience and technologies crane, including the Netherlands. So energy greenhouses reached a set of measures one of which is the use of polycarbonate [1 - 5] which provide essentially smaller heat losses as opposed to single-layer glass roofs of greenhouses developed in the USSR. Some designers cellular polycarbonate are taken with caution by reducing its turbidity under sunlight [6], which uses windows that have high heat insulating properties. However, the design of greenhouses in Ukraine should be borne in mind that the climate of the climate is very different from the climate of Holland, where powerful snowfalls are rare. High rainfall and low temperatures lead to the formation of greenhouses on the roofs of snow layer that prevents passage of sunlight, in consequence of which need to use special incandescent lamp power up to 1.5 kW [4, 6] .To exposure of plants to high cost of electricity makes issue clearing snow from roofs of greenhouses relevant.

In Soviet times, the construction of greenhouses have been developed taking into account the climatic conditions of northern countries, providing for long periods of low temperatures and strong snowfall. Greenhouses roofs were made of a single layer of glass, on the one hand required the use of large amounts of fuel but, if falling

snow, was able to increase the temperature in the room is easy to achieve melting snow on the roof of the greenhouse. This design was reasonable conditions USSR with lots of cheap gas from fields in Tyumen, Azerbaijan and Kazakhstan as well as the planned economy when downloading greenhouses was constant. In modern terms Ukraine to focus on such structures there is no possibility, based on the high cost of energy and the need for heating greenhouses regardless of changes in the cost of production in the market, as in the case of a large amount of snow on the roof of his possible mechanical destruction. Switching to a cheaper fuel alternative means of local origin, such as coal or straw, has problems such as the loss on the transparent roof of ash and soot which hinder the passage of sunlight in winter surgical removal which is also a complex technical challenge.

The purpose of research - to remove snow from the roofs of greenhouses design which provides low thermal conductivity, through the use of multiple layers of glass or polycarbonate, suggested in case of loss of snow provide warm upper layer. For the heating mode energy efficiency should ensure not just melting the snow layer and its lower layer only to facilitate sliding snow to melting troughs where it will provide a standard electric heating cable. Besides heating the snow should not cause a decrease in its albedo, ie to facilitate its melting under sunlight. The aim of the study was to determine the dependence of the temperature inside the greenhouse roof depending on the temperature in the middle of the room and incandescent lamps.

Materials and methods of research. Research conducted in the greenhouse roof which is structurally composed of two layers of polycarbonate thickness of 10 mm and 4 outer and inner layers respectively. The distance between the sheets of polycarbonate was 150 mm. For heating the internal volume has been used incandescent power of 100 watts. The temperature of the internal volume of the roof greenhouses was measured using alcohol thermometers are placed directly between layers of polycarbonate. Due to the transparent polycarbonate surface was achieved possibility of visual information about the state of temperature without disturbing the sealing of the roof. Parallel measured the temperature inside the room.

Results. As can be seen from these data, under incandescent temperature of the roof unchanged for 1 hour. Somewhat slower cooling than heating apparently

because the thermometer placed in the lower parts of the roof, and heated air by convection, went up up. When the outside temperature at - 10 ° C in the middle of the room and between the sheets of polycarbonate temperature was 15 ° C. That was enough to melt all the snow layer over 7 hours of research in clear weather. However, it was observed melting snow directly in front of incandescent lamps (Figure 2).

The explanation for this lies in the fact that due to the low thermal conductivity polikarbo-Nata melting was due to no heat radiation such as incandescent lamps.

Conclusions

1. To save energy when heating snow by thermal radiation should be used incandescent mirror placed at the bottom of the roof perpendicular to its surface.

2. In the case of a greenhouse roof several layers of polycarbonate emitters should be placed in the middle of the outer package, and the top layer of the material is advisable to make the minimum thickness that provides its mechanical strength, the structure of cell 2R or 3R.