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BENEFITS OF INTELLIGENT CLIMATE CONTROL SYSTEMS USING WEATHER FORECAST

Ключевые слова: микроклимат, теплица, электрокалориферная установка, климат-контроль

Keywords: microclimate, greenhouse, climate control**,** electric calorific installation

Аннотация: В статье рассматриваются преимущества, которые дает применение интеллектуальных систем управления микроклиматом с использованием данных прогноза погоды.

Abstract: The article deals with the benefits the use of intelligent microclimate management systems with the use of weather forecast data provides.

The main objective of the greenhouse crop production is to increment the economic benefits of the farmer by means of finding a trade-off between the improvement of the product quality and the cost for obtaining adequate climatic conditions using new greenhouse structures and automatic control strategies [1].

An intelligent system is an advanced computer system that can gather, analyze and respond to the data it collects from the surrounding environment. It can work and communicate with other agents, such as users or other computer systems. It can also learn from experience and adapt according to current data. An intelligent system might also support remote monitoring and management [2].

One of the benefits of using intelligent climate control systems in a greenhouse is to avoid conditions which can cause damage to the crop (e.g. high temperature or high humidity levels), and to achieve adequate temperature integrals that can accelerate the crop development and its quality while reducing pollution and energy consumption. Many conventional methods for controlling

greenhouse climate are known to be not effective since they are either based on an on-off control method or a proportional control method. As a result, losses in energy and productivity occur.

The diurnal temperature control is the main climate control problem. External disturbances strongly influence the air flow (and thus inside temperature and humidity), particularity the wind speed, the external air temperature, and solar radiation. Thus, it is convenient to include a mechanism to compensate for disturbances, and even to cancel nonlinearities (the energy balance is of nonlinear nature).

If we can predict the temperature inside the greenhouse using the weather forecast parameters such as the maximum and minimum temperature obtained, then we can take corresponding control measures in advance to make greenhouse environmental conditions suitable for the needs of plant growth [3].

The main advantages of intelligent climate control systems using weather forecast are energy conservation, better productivity of plants and reduced human intervention.

Energy conservation is achieved by improving the quality of compensation for changes in outdoor air temperature. This makes it possible to reduce energy consumption for the system of electric calorific installations over-ground heating, which is usually used in addition to the pipe over-ground heating system for quick compensation of sudden changes outdoors.

The increase in plant productivity is achieved by maintaining optimal parameters of temperature and humidity, CO_2 concentration and illumination.

The introduction of intelligent control systems allows you to eliminate errors caused by incorrect actions of the operator i. e. with the help of intelligent control systems it is possible to reduce human intervention.

In conclusion it should be noted that microclimate of greenhouse can be scientifically controlled to an optimum level throughout the cultivation period to increase the productivity by several folds. The proposed approach can also be applied in the development of intelligent heating systems for industrial, residential and agricultural premises characterized by significant thermal inertia.

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