Climate control inside the greenhouse: Temperature

We need to increase the quality of our production, that's why we need to improve our greenhouses with the climate control. We must be conscious about the lack of the actual greenhouses, so we need to promote the introduction of improvements and climate control machines.

If a greenhouse is not affected by external factors, the greenhouse climate efficiency will be bigger. The right enviromental parameters control allows you reduce the external factors effect inside the greenhouse, which conditions the production system. Even with this right control you can reduce the period of inactivity of the greenhouse. The improvement of the environmental control in the greenhouses supposes a bigger flexibility of the production calendars.

The crop development is determinated in all the diffreren growth phases is determined by environmental factors: temperature, damp, light, etc. We need the conjuction of those factors, inside of a minimum and maximum levels, to make possible the the right operation of the plants, outside of those levels, the plants stop their own metabolism.

The temperature is the most important parameter because it has a big influence on the plants growth and development. Normally the ideal plants temperature is between 10 and 20 degrees.

We can use the following systems to keep the right temperature inside the greenhouse:
- Heating systems, by warm air or water.
- Thermic screens (energetic saving and shading)
- Natural and forced ventilation
- Refrigeration by water evaporation

HEATING SYSTEMS BY WARM AIR

You can increase the greenhouse temperature with these heating systems, which warms the air volume. In this way the air is warming is some hot focus and then, the warm air is driven towards greenhouse atmosphere.

The warm air generators can be of indirect or direct combustion. The heaters can be connected to some circulation system, which distributes the warm air through a perforated pipe. Those heaters work with gas oil or propane gas. Even the heaters have a mechanical system of turn on and off by means of thermostat.

These systems have the advantage of a minor economic investment and major versatility, obtaining a homogenization of the total volume of warm air of the greenhouse.

HEATING SYSTEMS BY WARM WATER

This warm air distribution system is based on the circulation of warm water by the pipelines. The water is warmed in the boiler to approximately 80-100 ºC and the pipelines are placed on the floor. The pipelines are made of plastic or metal (the polyethylene is cheaper than the steel or the aluminium).

In this way you get uniform temperature in the greenhouse due to the warm water distribution in the greenhouse base (energy saving). But the installation costs are bigger than the heating system by air.

THERMIC SCREENS AND SHADING NET SYSTEM

The interior closed thermic screens are sheets made up of aluminium and polyester. The screens are weaved by acryl wire and the screens are moved by a transmission mobile system. This kind of screen has the following features:

1. TEMPERATURE DECREASE INSIDE THE GREENHOUSE UP TO 10 ºC. In sunny days when the temperature increases, the reflection level, due to aluminium, allows a decrease of the temperature inside the greenhouse.
2. LIGHT RADIATION CONTROL from 20% to 100% less due to the aluminium reflection. It is important that the aluminium sheets will be planed in order to get the solar radiation and then reflect the solar rays up.
3. HUMIDITY ALTERATION by the screen absorption and evaporation. In case of humidity excess, the humidity is absorbed by the screen on its top and then the humidity is evaporated.
4. ENERGY SAVING. The screen stores the energy during the day, the screen reduce the cost of fuel until 7%. During the night the internal surface of the aluminium reflects the internal radiation towards the ground and this effect let have high temperatures during the night.

This kind of screen can be installed in every kind of greenhouse, parallel to the floor and it is installed the higher as possible. If the screen is installed very high, you will be able to control the temperature in more space.
As a result of the closed structure, during the night the temperature is higher. This kind screen is appropriate to be used in cold areas.

Use advantages:

- Avoid sudden temperature changes.
- Interior drip reduction
- Internal ventilation regulation
- Homogenous crops
- Less crops transpiration
- Water saving
- Better human labour conditions

The shading screens are made up by aluminium and acryl. It can be placed inside or outside the greenhouse. This kind of screen can get a temperature drop up to 10 ºC because it lets the air flow and, at the same time, this screen shades the greenhouse.

The screens are perfect to be used in warm seasons and let you drop temperatures when there are high temperatures and the greenhouse atmosphere is dry.

Moreover, the screen protects the crops of the direct sun action. (In winter, this screen is used to keep warm temperatures in the greenhouse).
The screen effect makes the crop stronger and makes the crop get used to the external conditions step by step.
The screen can be installed inside or outside of the greenhouse. The mobile systems let you control the intensity of the light and the exposure time wanted.

Main features:

- Light intensity regulation
- Temperature control
- To be used in warm areas
- It can avoid frosts
- Keep 3-2ºC in cold nights
- Suitable to be used in shading structures
- Shading from 45% to 75%

NATURAL VENTILATION

The ventilation consists of the renovation of the air inside the greenhouse for convection. This renovation influences on the temperature. The natural ventilation consists of zenithal or lateral windows, which are opened to let the fresh air come inside the greenhouse and refresh the internal atmosphere.This system can be operated manually or automatically with geared motors.

FORCED VENTILATION

The air recirculators are used to get uniform climate conditions. These fans moved the air of the greenhouse and you get no humidity and temperature variations. With this constant movement you get more air renovations inside the greenhouse.

The use of these fans have the following advantages:

- Less humidity in the greenhouse atmosphere. With this we avoid the condensations.
- Uniform temperature
- Avoid pests in the crops and get better perspiration of the crop
- Easy and fast to get out the hot of the greenhouse during warm seasons
- Better heat distribution
- Very useful to disperse the humidity with fog systems.

The exhausted fan is designed to get out of the greenhouse the warm air and the humidity. If you want have 100% efficience of this exhausted fan you should put it on the right place and have one with right size.

FOG SYSTEM

The fog system is a local humidification system which reduces the temperature without moistening and this system produces an artificial fog and it cools down the area. This system allows easy water evaporation in millions of water elements and it gets down the temperature. The fog system works pressurizing water towards to the pipes with holes, which distributes water particles in the area atmosphere. When these water particles evaporate, the water gets the local warm and causes a temperature drop. This fog system is easy and quick to install through some assembly standard groups. This fog system can be used in greenhouses, restaurants, golf and football areas, swimming pools, summer shows, gardens, funfairs…

COOLING SYSTEM

The cooling system keeps the uniform temperature and it is get by humidifying the cellulose panels. These panels refresh the atmosphere of the area due to the water evaporation, which is driven by the extractor from one side to the other of the area.

The most usual thing is to have a side of the structure with the cellulose panel with its complete water supply and drainage system. This system has canalizations, water tank, water pump, water supply and drainage kit, panel level out kit. In the opposite side of the area should be the extractor lines, which make the external air be driven by the extractor through the cellulose panels and with this we get more humidity in the atmosphere and a temperature drop.

This system guarantees the uniform humidity of the refrigeration panels by the evaporation and the continuous water flow.

It has a modular design and it offers you very flexibility because you can adjust the panel length according to the need. The water is provided on the cellulose panel top side by evaporation from a distribution tube with holes, located on the top side of the tube. This location avoids blockages and guarantees the right water distribution through the whole panel.

There are some options available concerning the cellulose panel thickness and every option has a specific pump, a deposit and a water supply and drainage kit.