Text and images: Harry Stijger

Johan and Jaré Reijm (right): "With this ventilation system we produce the same or more gerberas but with less energy."

Dehumidify and cool with active ventilation

Less energy input yields as many or more gerberas

Since 2014 Dutch gerbera grower Reijm Nieuwerkerk has been using a system to actively ventilate the greenhouse air as part of its Next Generation Growing strategy. The continuous refreshment of the air provides an optimal microclimate at the bottom of the crop. The company is producing the same quality gerberas with less energy input.

Reijm Nieuwerkerk cultivates 5 ha of pot plants and 3.5 ha of gerberas at three locations in Nieuwerkerk aan den Ijssel, near Rotterdam, the Netherlands. Annually the company produces 4.5 million pot plants and 16 million gerberas in many colours, from large flowering to minis.

Cultivation is in stone wool substrate in a gutter system. A double screen, comprising a black out and energy cloth, has been installed at the top of the greenhouse. A CHP cogenerator with a flue gas cleaner for CO_2 production also generates electricity for the lighting (95 µmol).

Active ventilation

Last year, for the Next Generation Growing, the Active Ventilation System (AVS) by Van Dijk Heating was installed in 7,500 m² of gerberas. This year the area has been extended by 17,500 m². The system comprises a wall unit made of plastic which contains a fan, mixing valve, heating element and a filter. From the unit and running along the greenhouse wall is a PVC pipeline which acts as the distribution system. Air hoses that contain small holes for air injection are connected to the pipeline. The air hoses hang under the rows of plants.

The greenhouse is dehumidified thanks to active ventilation of the greenhouse air that is mixed with relatively dry outdoor air. The heating element provides low value heat (40°C water from CHP) for warming the external air to greenhouse temperature.

Learn from practise

The reason for installing this ventilation system is to produce the same or more gerberas with less energy. "The art is to input the right amount of energy at the right moment. In the past we used to turn on the minimum pipe for this but actually we didn't know exactly what we were doing," says Jaré Reijm. He runs the family business together with his brother John. Over the years the grower has carried out several trials with gerberas and therefore has learned a lot about the greenhouse climate without having made too much investment in his nursery. "But then it's not easy to further improve the greenhouse climate, although also not easy to make an investment and then to earn it back. However, installing this system has worked well. Last year we

achieved a good cultivation climate. We were able to keep the climate under the plants somewhat drier and above the plants more uniform," says the grower.

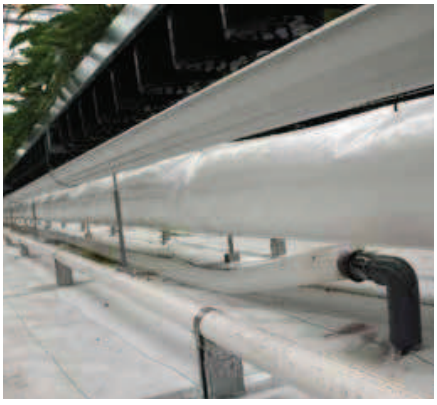
Better temperature distribution

Joek van der Zeeuw, of Van Dijk Heating, explains: "With traditional methods of growing you always need some gaps in the screen and you have a cold dump were you don't want it. Now, by using this system to inject outside air into the greenhouse you obtain a small amount of over pressure. That is enough to ensure that no cold air enters through a hole or gap so the temperature distribution in the entire greenhouse is more uniform."

The grower indicates that the temperature difference used to be 3°C and now is just 1°C. Further, he would like to better control the microclimate between the plants. The holes in the hoses where the air comes out are therefore set to point upwards. The air that is injected into the greenhouse has been mixed with air from outside and so contains less moisture. Due to a lower RH the crop is less susceptible to disease. "By continuously refreshing the air, we now have a good climate at the bottom of the crop. As a result we think that the flowers are less susceptible to fungal diseases such as Botrytis. And we can achieve this without using the minimum pipe," says Reijm.

Drive controlled fans

The system has an air-displacement capacity of 6 m^3 per m^2. The fans in the wall units are equipped with energy-efficient EC motors that are controlled by a computer network. The fans can be reduced to 50% of the capacity, so they only consume 100 Watts of electrical energy for dehumidification. At full output 800 Watts is needed. Reijm tries to run it for as long as possible at low power, until the valve for the outside air is fully open. If then the humidity in the greenhouse rises, the speed of the fan is increased gradually. In this way the grower makes the most efficient use of the system.



The air hoses under the cultivation gutters ensure that the climate under the plants is drier and above the plants it's more even.

Joek van der Zeeuw: "By using the system to inject outside air into the greenhouse we get a small amount of over pressure. As a result, the temperature distribution throughout the greenhouse is more uniform."

Normally, the ventilation units are fitted in an outside wall to be able to draw in outside air. This was not possible in a partitioning wall with the pot plant greenhouse. Here separate units were made that draw in outside air from the top and have air passage through the roof. This suction hole in the roof is covered with a flat sheet so that the roof cleaner can drive over it.

Winter and summer

"Due to the active ventilation it is possible to use the energy screen more in the winter months because we can better control the climate, the humidity and the temperature distribution," says the grower. Last summer he used the system for the first time for cooling. This worked well. Cooling was achieved by sucking in outside air and injecting it into the greenhouse.

Reijm: "Despite the tropical temperatures outside the greenhouse remained cool for longer. Even when it was 30°C outside, it remained 25°C under the crop. Because we measure everywhere under the crop, we see a difference with the traditionally grown crop. Because the temperature is lower for longer, we can open the vents later. This keeps the CO_2 inside. Due to the cooling, the crop remains more active so that the quality of the flowers is better. The diameter and stem length remained the same during the summer. However, this was not the case with the traditional cultivation. The flower was smaller and the stem was shorter."

Pure CO_2

Reijm uses the system for dehumidifying and cooling, but not for heating. The grower doesn't dare to use the latter for Next Generation Growing. "By heating from underneath we would push the crop too much. As a result the crop would transpire more, which would result in a higher humidify. Then we would have to get rid of the moisture in one way or another and that costs energy."

A disadvantage of the system is that because less heat is required, the grower has a CO_2 shortage. Because the CHP cogenerator produces heat, which the grower would have difficulty getting rid of, it only runs to produce electricity for the lights. However, in the summer months it doesn't run for long enough to provide sufficient CO_2. This summer the grower will have to buy and inject pure CO_2.

Uniform growing conditions

The grower would like to have the same growing conditions for all the gerberas. Because they change the crop every three years, they will be able to install this system in the last hectare of gerberas next year. Installing it while a crop is present is not wise, according to Reijm. In addition, they will replace the entire cultivation system so they can do everything at the same time.

Summary

Since 2014 Dutch nursery Reijm Nieuwerkerk has been implementing the Next Generation Growing, a system that includes active ventilation. The grower can dehumidify the greenhouse air by mixing it with air from outside. He can produce the same number of gerberas with lower energy consumption. The continual refreshment of the air provides an optimal microclimate at the bottom of the crop. As a result flowers are less prone to fungal diseases such as Botrytis.