



FANS IN INNOVATIVE CLIMATE CONTROL



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Screen fan from Hinova

Fans are becoming an important tool for energy efficiency in greenhouses. This article outlines the wide range of fan technology, from air fans to advanced Air Treatment Corridors. Fans offer several advantages:

Humidity control

Fans help to reduce the air humidity. It takes far less energy to warm up dry air than to warm up humid air, so drier air is cheaper to heat. The use of fans can reduce the need for venting and heating, thus saving energy. Recycling the air in greenhouses with fans preserves heat and CO₂.

Fans drive moisture away from the plants and up against the cold greenhouse roof, where it condenses. Air movement improves the uniformity of the greenhouse climate: it eliminates cold spots where plants get damp, and where moulds and fungal diseases would flourish. The best remedy would be to address the cause of the uneven temperature, for instance to adjust the heating layout. But if that is too difficult, the use of fans is a good alternative.



Corridor from Enerdes

Air movement also stimulates transpiration and improves the nutritional condition of the plants and is essential for plant health. The greenhouse atmosphere can be very dull and humid on mild overcast days, and even more so under a closed screen combined with lukewarm heating pipes. Such conditions restrict the transpiration and nutrient uptake, which can be remedied by increasing air circulation.

Heating and venting

Traditional methods of generating air movement include the reduction of pipe temperature to a minimum, opening ventilation only slightly, and gapping the energy screen. These actions all involve concurrent heating and venting, which does not help the energy efficiency or the carbon footprint of covered crops. It is recommended that overall cooler conditions are more beneficial than alternate heating and venting to achieve climate control.

Calculations prove that using fans is more energy efficient than combined heating and venting. And the use of fans fits in the trend of 'electrification' of greenhouse climate control. Using fans, especially if they have a built-in electric heating element, is a step towards electrification. With the move away from fossil fuels due to climate change, towards low-carbon sources of sustainable power, electrification is a good option. It is also in alignment with New Zealand's plan to 'decarbonise.'



ATU from Enerdes

Fan functionality

Fans are important tools in 'The new way of growing', which is an innovative method of climate control and plant management in Europe. (See previous article in this series.) It aims to improve energy efficiency, production and quality. This involves the use of fans of various shapes and sizes, with different functionalities, for instance:

- 1 to circulate the greenhouse air
- 2 to draw in outside air
- 3 to create vertical air movement
- 4 to move air through screens
- 5 to mix two air flows
- 6 as part of an Air Treatment Unit (ATU) or an Air Treatment Corridor

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Fan outlet

The fan outlet can be either an open pipe that blows the air directly into the greenhouse space, or a large perforated sleeve (tube) that spreads the air over a much larger area. The sleeves are used especially under a hanging gully (see photo).



Sleeves from VerbakelBomKas

Horizontal and vertical fans

Horizontal fans have been used for decades in New Zealand for keeping plants dry and creating an even temperature and humidity. The configuration of the fans is important, but not discussed here. Horizontal fans may also be used for spreading plant protection products using the LVM (Low Volume Mist) method.

Vertical fans create air movement from the top to the bottom in the plant, to even out temperature differences between the plant head and lower leaves. Vertical fans are quite commonly used overseas, especially in greenhouses with lighting.

Screen fans

Screen fan systems are a special form of vertical fan, designed to draw air from above a closed screen. This is beneficial because the air in the upper greenhouse compartment is drier than the air in the lower part (because it is much colder there). The exact temperature and humidity depend on the type of screen, how well it closes, and whether the roof vents are fully closed or very slightly open. Screen fans create an overpressure under the screen, which requires that some pressure release valves are installed in the greenhouse wall.

Screen fan systems

Some special screen fan systems allow the mixing of two air streams: cold dry air from above the screen and warm humid air from below the screen. One example is the Hinova VentilationJet System (see photo). The vertical air inlet pokes up between two screens, and because it is so thin, it does not create a gap. A connected fan in this system spreads the air nearly vertically into the greenhouse under the screen.



Airmix screen fans from Vanderendegroep

Another example is the AirMix (see photo) which pushes the air out horizontally. It has a controllable valve for mixing two air flows. In principle air is taken from both below and above the screen and mixed together. But it is possible to take in greenhouse air only, and use the fan as a simple horizontal fan.

Fans drawing in outside air

Using fans to draw in fresh air from outside is an important element of humidity control in semi-closed and other modern greenhouses. Cold outside air has a very low absolute humidity. (The relative humidity can be high, but that is irrelevant). Drawing in a considerable flow of dry outside air makes the greenhouse immediately much drier. This fresh air must then be warmed to the required temperature.

Air Treatment Units and Corridors

Air Treatment Units (ATUs) contain a strong fan in addition to other technology. ATUs are the core of semi-closed greenhouses that have been built worldwide in a range of climate zones. Different suppliers have developed different designs, and often offer custom-made systems. Some examples can be seen in the photos. The results are impressive, especially in harsh climates.



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ATUs from ITB

Some greenhouses have a series of ATUs installed outside against the greenhouse wall. Alternatively, a series of ATUs is installed in an enclosed two-meter-wide corridor over the length of an entire wall of the greenhouse. Here the greenhouse air is mixed with fresh air in the required ratio. The mixed air can be treated (heated, dried, cooled, etc) depending on what is needed in a particular climate. The treated air is then blown into the greenhouse, sometimes via an open pipe but mostly via perforated sleeves that can be over 100 metres long.

ATUs seem to be the technology of the future, with new innovative versions being developed all the time. ●



ATUs Greenvent from ITB