Innovating the greenhouse market starting with climate

The mechanical ventilation system applied to the semi-closed glass greenhouse
Munter designs and realizes the first climate-friendly solution dedicated to the one and only semi-closed greenhouse in Italy

Producing high-quality, healthy, genuine tomatoes with an unmistakable flavour, 365 days a year, in a sustainable, efficient and affordable way: this is the goal of the Lapietra Brothers, a pioneering family business, located in Monopoli, in the picturesque setting of Apulia, where full-field horticulture is the rule. Here, Enzo and Lino continue their father Antonio’s legacy but focus, on the contrary, on greenhouse cultivation and soilless cultivation. Their tomatoes and cucumbers are not grown in the open field, they grow in greenhouses equipped with some of the most advanced technologies on an international level. This innovative choice allows them to take full advantage of solar energy, particularly abundant in this area, while significantly reducing water consumption.

Pursuing and adopting sustainable and cutting-edge solutions, has always led them to surround themselves with highly specialized and innovative partners. Hence the meeting with Munter, a global leader in the field of energy efficient climate control solutions.

The partnership with Fratelli Lapietra was immediately constructive, stimulating and highly challenging. After an in-depth study of the territory and the existing plant structures, our Application Team designed, developed and implemented an innovative solution able to ensure an optimal climate throughout the year.

From the perfect synergy between climate uniformity and constant monitoring of environmental parameters we realize:

- zero residue product
- increased productivity
- excellent product quality
A greenhouse that “breathes” thanks to positive pressure

The beating heart of this refined ecosystem is the semi-closed glass greenhouse, the first in Italy, to which Fratelli Lapietra have dedicated over 2 hectares of their total production of 10 hectares. This type of greenhouse, covered by an iron-glass structure with soft light, allows the regulation and optimization of the intake of solar radiation depending on the season and, through the ventilation management system, is able to manage the CO₂ levels and avoid the formation of pathogenic outbreaks. Growing in a semi-closed glass greenhouse means recreating an optimal micro-climate characterized by a continuous air exchange. The result is a product with zero residue, that is, without residues of phytosanitary products.

**Munters solutions for semi-closed greenhouse**

Thanks to their decades of experience, the Lapietra Brothers have identified climate control as a key variable to achieve a standard crop both from a quantitative point of view, and qualitative. All the greenhouses installed in the company are “smart”, they are equipped with sensors that monitor climatic parameters. For the semi-closed greenhouse the situation is more complex, increasing the number of sensors necessary to ensure an adequate control of internal parameters.

The solution designed and implemented by Munters guarantees a constant standard temperature and relative humidity. It is an integrated high-tech, computerized and automated system, contributing to environmental sustainability, focused on the control of many environmental variables, in and outside the greenhouse structure. The amount of data processed daily allows the system to adapt the microclimate of the greenhouse and the ecosystem inside, which provides the crops with the optimal habitat in which to grow.
System fundamentals

- The CELdek® panel with patented technology is essential to guarantee evaporative cooling. This is one of our most innovative products consisting of cellulose sheets with unique flute angles. The design ensures high evaporation efficiency and extremely low pressure drop. The water is recirculated by a pump station and redistributed to the surface ready for evaporation in contact with air. The CELdek® evaporative panel achieves maximum performance when used in conjunction with Munters modular gutter, available in stainless steel in the WDP model or in the innovative MPG plastic system, which is assembled without glue or silicone.
- High-pressure air-handling fans with adjustable speed EC motors in a robust and versatile plastic construction with flow straighteners.
- Perforated air gutters made of 3 polyethylene plastic films to uniformly distribute air.

How a semi-closed greenhouse works

The management of the climate inside a semi-closed greenhouse relies on climate control systems and the distribution of treated air, which allows multi-parameter monitoring, while minimizing energy losses.

The first important difference between a traditional greenhouse and a semi-closed greenhouse is the presence of the climate corridor. While in traditional greenhouses the management of temperature and humidity is regulated by the ridge windows, and therefore is closely linked to external climate conditions, in the semi-closed greenhouse the external air is recalled by depression (through fans) in the climate corridor, where it is treated (heated, cooled, and humidified) according to its needs. If necessary, the indoor air is re-circulated and treated or mixed with the air recalled from the climate corridor. For this to be possible, it is necessary to operate under pressure compared to the outside, i.e. keeping the greenhouse in a condition of overpressure.
Ventilation in 4 steps

Cooling
1. Warm air enters through the CELdek® cooling panel, which is reducing its temperature as humidity increases
2. Air mixes within the climate corridor
3. Cooled air is drawn in by the fans and blown into the air ducts
4. The cooled air travels through the entire air duct, exiting each hole progressively
5. The air exits from the ridge openings, pressurized to maintain the overpressure

Heating
1. Cold air enters through an opening in the climate corridor, or is recirculated from the inside
2. Cold air, or recirculated air, is heated directly in the greenhouse with hot-water radiant piping
3. Heated air is drawn in by fans and blown inside the air ducts
4. The heated air travels through the air duct exiting progressively from each hole
5. Air escapes through the ridge openings, pressurized to maintain overpressure

Destratification
1. Warm air enters the climate corridor through openings communicating with the greenhouse.
2. Air is drawn in by fans and blown inside the air ducts
3. The air goes through the whole duct, coming out progressively from each hole

Dehumidification
1. Dry air enters through an opening in the climate corridor
2. Fresh air is mixed with warm air inside the greenhouse (recirculation)
3. Air is drawn in by fans and blown inside the conduits
4. Dry and warm air flows through the duct, exiting progressively from each hole
5. Excess air escapes through the ridge openings which are very pressurized to maintain overpressure
A customized project

Azienda Agricola Fratelli Lapietra represents excellence in Italy, where one of our most strategic Business Units is based. Our partnership’s success was born from an ambitious project, that of being able to taste the same tomato and savor its unmistakable flavor in both summer and winter. Our ALL-IN-ONE solution has taken into account the specificities of the company, the climate and geographical variables. The outcome is a customized project, the result of a continuous support process. Our team of experts and researchers, with an international experience developed at every latitude, has supported Fratelli Lapietra since the design phase, has assisted them throughout the installation phase with consulting services and optimized logistics operations, which is still present with the after-sales service.

Results obtained

Azienda Agricola Fratelli Lapietra develops an average annual production around 4,000 tons of tomatoes and over a thousand tons of cucumbers whose destination is mainly the regional quality retail market, according to the zero km concept, with requests also from Northern Italy and Central Europe. Cultivation in semi-closed greenhouses has allowed a significant increase in production per square meter of surface area, a reduction in the risk of contamination and a drastic reduction in the use of pesticides.

Tomatoes grown in this greenhouse are not only tastier, more genuine and healthier, but also and above all more sustainable: this technology has allowed Fratelli Lapietra to optimize water consumption and make the most of solar energy. The first semi-closed glass greenhouse in Italy mechanically ventilated by Munters has thus transformed into a laboratory of innovation that makes it more competitive, efficient and economical compared to traditional greenhouse crops, the new frontier of protected crops.

For more information, visit: munters.com/greenhouse

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