

DEHUMIDIFICATION & HERMETIC SCREENS

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Unstable energy prices and ambitious climate objectives are forcing the horticultural sector to take action regarding energy consumption.
Research is in full swing, and new energy-saving technologies are entering the market at a rapid pace.

This whitepaper explores two of these new technologies: **dehumidification systems and hermetic screens**. The combination of both gives growers a powerful tool to better control the greenhouse climate and reduce energy consumption.

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DEHUMIDIFICATION SYSTEMS

In recent years, many types of dehumidification systems have been introduced. On the one hand, there are systems that rely on bringing in drier outside air, and on the other hand, systems that make use of cooling technology. A final group of dehumidifiers uses absorption of moisture in drying agents.

Systems that bring in outside air can do so through the screen and/or the greenhouse roof, but it is equally possible to do this through the sidewalls of the greenhouse. For dehumidification systems that work based on cooling technology, no connection to the outside is required since these systems remove moisture from the air by themselves.

On the other hand, such systems consume more electricity. When the outside air is too humid, dehumidifiers that rely on outside conditions cannot always be used. Finally, there are also hybrid systems combining both principles.

The common factor among these dehumidification systems is that they perform best in combination with a hermetic screen. Such a screen allows a dehumidification system to operate optimally, while the hermetic screen ensures excellent insulation of the greenhouse.

HERMETIC SCREENS

Hermetic screens have a tightly woven structure. This allows them to very effectively separate the air above and below the screen and to retain moisture. Experts confirm that hermetic screens have very low permeability. This low permeability gives hermetic screens their excellent energy-saving properties.

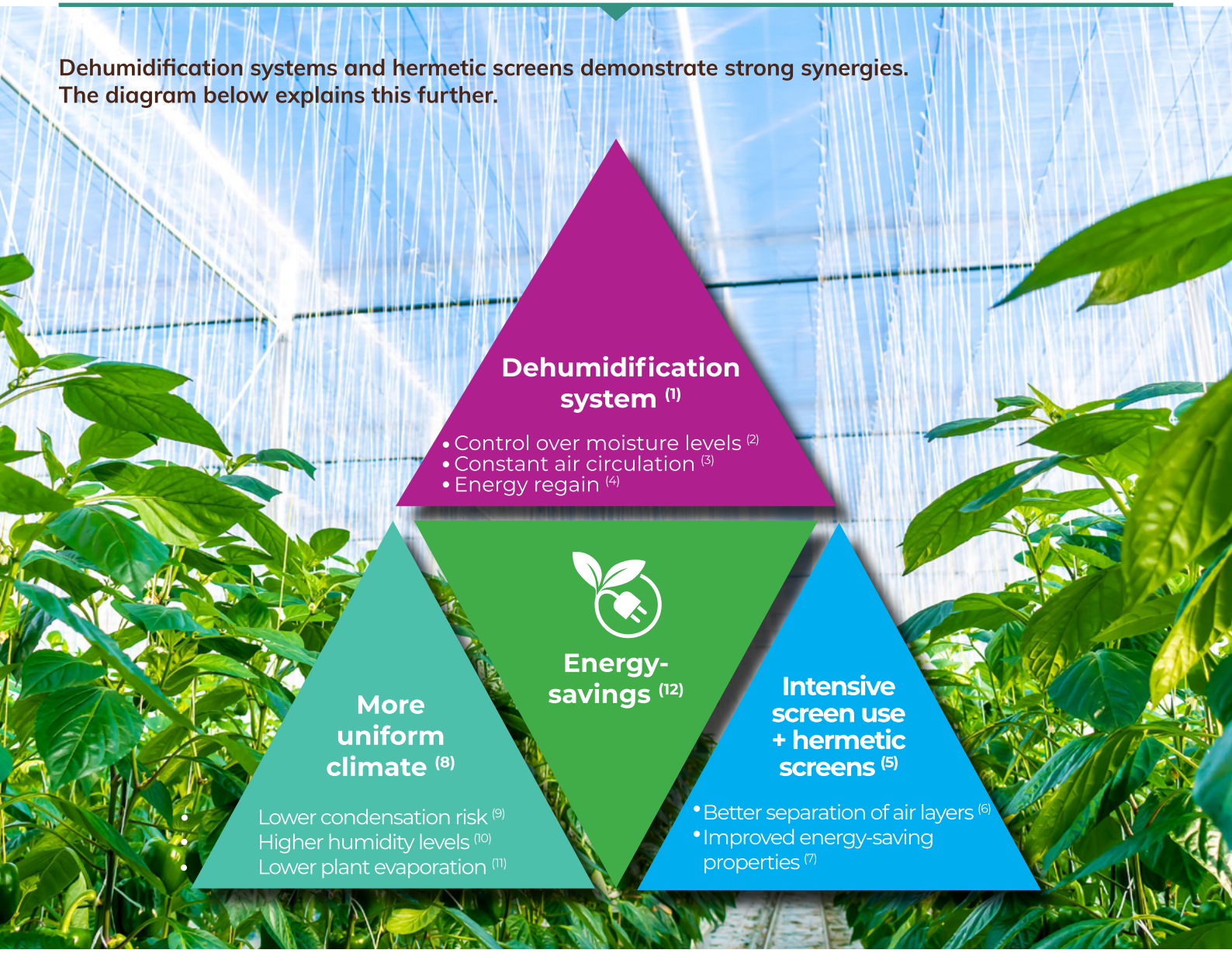
Screens with low permeability are characterized by a non-porous structure. This is an important difference compared to most other screens, which have a porous structure. Porous means that these screens contain large numbers of microscopic holes, allowing air and moisture to pass through naturally but uncontrollably. The porous structure is created by incorporating yarns into the screen. By removing these yarns from the structure, a hermetic screen is created.



Hermetic Clear - Tomato nursery Jos Pijl

Because this porous structure is absent, hermetic screens block air and moisture flow through the screen much better than the average energy screen. This principle is the foundation of the hermetic screen's excellent energy-saving features.

Dehumidification systems and hermetic screens demonstrate strong synergies. The diagram below explains this further.



A dehumidification system (1) allows control and management of the greenhouse's humidity level (2). The intake and introduction of air also creates a constant air circulation (3). This results in a more uniform greenhouse climate (9). Additionally, some dehumidifiers allow the recovery of sensible and latent heat (4), which directly contributes to the energy efficiency of the greenhouse (12).

Thanks to controllable humidity levels and a more uniform greenhouse climate, growers can use screens more intensively. Furthermore, they can even transition to a hermetic screen (5) with a higher energy-saving value (7). The fact that less venting is required and that the air above and below the screen is better separated by the hermetic screen (6) further improves climate uniformity (8).
The tightly woven structure minimizes leakage losses through the screen, resulting in lower heat demand and reduced energy consumption (12).

Finally, a more uniform greenhouse climate (8) reduces the risk of unwanted condensation on the crop (9). This makes it possible to grow at a higher humidity level (10). Since plants transpire less at higher humidity (11), the energy consumption of the greenhouse drops (12) — after all, evaporation is an energy-driven process.

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Pijl Tomaten

TESTIMONIAL

Tomato nursery Pijl LV in Belgium, is a pioneer regarding dehumidification and energy savings.

More than 15 years ago, when the first greenhouse dehumidification systems were developed, Jos Pijl made his nursery available for the construction and testing of the first prototype in a new greenhouse compartment. Already then, Pijl LV was working on the greenhouse of the future.

And the hard work paid off. When the new greenhouse was completed in 2013, it was equipped with a dehumidification system combined with a single transparent energy screen (unlit tomato cultivation). This made it possible to screen intensively and save energy without compromising crop activity.

The system works as follows. Just below the energy screen, the installation draws in humid greenhouse air. Through a counterflow heat exchanger, sensible and latent heat are transferred to fresh, dry air drawn in from outside, bringing it up to greenhouse temperature. The air is then distributed throughout the greenhouse via ducts under the crop.

As is often the case with new technologies, a learning curve was involved. Jos, who was closely involved in the installation and optimization of the system, recalls: **“We discovered that the energy screen that was present in the cultivation compartment at the time was too porous.**

The porous character caused colder spots in the crop — something you naturally want to avoid. We then switched to a hermetic screen from Phormium. That proved to be the solution. The improved separation of the air layers above and below the screen created a more uniform climate. The hermetic properties of the screen kept the energy inside and allowed us to fully benefit from the latent heat contained in the moisture.”

“Wim Pijl confirms:
We still believe that combining a hermetic screen with our dehumidification system yields the best results. Recently, we renovated the Hermetic Clear screen, as energy saving will also become a hot topic in Flanders in the coming years.”



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