By Kurt Parbst:

Importance of humidity control

Year-round production of greenhouse flowers and vegetables requires heating, lighting and, at times, cooling. All of these things require energy. Efforts have been made since the 1980s to reduce the energy required for greenhouse production.

Heating is used for not only maintaining ideal temperatures, but for managing relative humidity. Humidity management is important for the control of fungal diseases.

Downy mildew, powdery mildew and botrytis outbreaks can all be traced to favourable environmental conditions … favourable for these pathogens, that is. Avoiding these favourable conditions can reap several benefits. Leaves can become wetted at times, and in areas within the canopy of high relative humidity. A dew point temperature can be reached on leaf surfaces that are radiating energy to their surroundings and thus drop the leaf temperature lower than the surrounding air. If a leaf reaches dew point, condensation will occur. Wet conditions result in a reduction of crop quality and yield loss. This leads to increased expenses associated with spraying fungicides, and a potential loss of effectiveness of fungicides due to resistance development.

Historically, the cold surface of a glass house was an effective dehumidifier. However, efforts to reduce energy consumption led to innovations such as more highly insulated greenhouse envelopes made up of multiple layers: multilayer rigid plastics and films, and insulating, energy curtains. While greenhouses now effectively have a lower heat loss rate, they also have a lower dehumidification rate. So, dehumidification on the underside of the glazing can be insufficient and high humidity levels prevail.

Heating for humidity control eventually over-warms the air. Dehumidification must now be accomplished by exchanging the moist indoor air with drier outside air. This practice of heating and purging leads to reductions in both temperature and humidity, which can lead to saturation conditions and wet leaves.

A desiccant is a good fit for the greenhouse application as saturation conditions are avoided. A group of scientists and engineers at the technology company Agam Energy in Israel create machines based on technology that was developed to solve thermodynamic problems in the extraction of geothermal energy for a global leader in this area. The Ventilated Latent Heat Converter (VLHC) is a technology that was designed with greenhouse humidity in mind.

This energy is supplied to the dehumidification machine as hot water that is used to drive water off the desiccant and is recaptured and supplied back to the greenhouse. In this method, dehumidification is accomplished by energy that must be supplied to the greenhouse anyway for heating. Not only is this dehumidification essentially “free,” it reduces excess nighttime transpiration, which triggers large savings, typically a 60 per cent reduction, compared with traditional heat and purge dehumidification as transpiration is essentially cooling the crop and greenhouse working against heating. This technology allows growers to convert any existing greenhouse into a semi-closed greenhouse, preserving heat and supplied CO2.

Agam VLHC is finding success with growers that heat their greenhouses through the winter and also struggle with humidity in the fall and the spring. Growers of a variety of crops have adopted the Agam VLHC technology to save energy and decrease fungal related problems.

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Publication date: 6/18/2015
