ARGUS® CONTROLS

A CONVIRON COMPANY

Daily Light Integral
CONTROL SYSTEMS

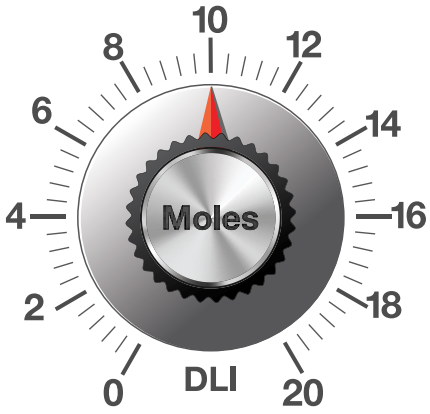
Managing and standardizing the total daily light delivered to greenhouse crops

www.arguscontrols.com

Argus has developed a novel control application specifically for managing and standardizing the total daily light delivered to greenhouse crops.

- **Measures the Daily Light Integral (DLI) at the crop level**
- **Uses a new algorithm to predict the available natural light as the basis for supplementary lighting control**
- **Delivers a standard DLI despite daily and seasonal weather variations**
- **Optimizes energy consumption and lamp usage**

Despite many advances in greenhouse designs and equipment, light is at best a partially controlled variable for most greenhouse horticulture applications. Even with the addition of supplementary lighting and shading systems, it is difficult to provide plants an exact amount of daily light given the unpredictability of weather and the seasonal fluxes in solar radiation reaching the crop. Traditional supplementary lighting strategies have focused on photoperiod extension and maintaining minimum light intensities. While these types of lighting strategies are useful, they are not an effective way to provide a uniform amount of daily light.



The **Argus DLI Control Program** begins with a target DLI and a predicted maximum DLI from sunlight based on the time of year, the location, and the light transmission efficiency of the greenhouse. Rather than rely on weather forecasts or external connections to forecast data, the program is fully self-contained. It calculates the potential available DLI from a **Seasonal Light Intensity Model** running natively on the Argus system. This model calculates the dawn to dusk solar intensities for each day based on the predicted weekly maximum PAR intensity values at midday based on location and time of year. The DLI program updates its predictive calculations throughout the day by comparing the actual light received by the crop to the potential light (the amount of sunlight potentially available on a clear sunny day). Supplementary lights are only operated when the program determines there is a high probability that the DLI Target cannot be achieved using the remaining sunlight potential. In this way, it is possible to deliver an accurate, repeatable DLI while minimizing purchased energy and lamp operating hours.

To further increase overall accuracy and reduce energy use, the program can optionally compensate for any daily deviations between the actual DLI delivered and the DLI Target by carrying forward a rolling average for up to seven days. For example, if the DLI Target is exceeded by 2 moles/m^2 (per day) on a bright day (when there was no need for any supplemental lighting), this 'surplus light' can be carried forward into the next day's calculations, reducing the next day's DLI Target by 2 moles. This can produce a consistent multi-day average DLI even when there are some variations between days.

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