Fall 2007

ARGUS ADVISOR

News for Argus Control System Owners

As we move into the shorter days of fall in the northern hemisphere, light becomes an increasingly scarce commodity. We are once again reminded how important it is to maintain a clean and obstruction free greenhouse to maximize the capture of available light. When that is not enough, supplementary lighting, though expensive, becomes the only option.

It's always easier to make decisions about shading or supplemental lighting when the natural light levels are extremely high or low. However, it's much harder to judge the value of manipulating light levels when they are somewhere in between. When should you turn on the lights? For how long?

Studies have shown that specific plant response tends to decline in proportion to falling light levels until a threshold point is reached. After that, photosynthesis activity declines drastically. The goal with supplementary lighting is to try to keep your plants away from this tipping point. That's why we think it's worth keeping track of light levels, whether you simply monitor and interpret the readings from your weather station, or measure the actual PAR light that your crop receives.

Alec Mackenzie

Lighting Control

Controlled high-intensity-discharge (HID) lighting is beneficial as a supplement for low natural light levels. Lighting can also be used to extend the natural day length for controlling the photoperiod flowering response of plants.

The Argus System provides specialized control programs for operating lighting systems for both photoperiod control and supplementary illumination.

Photoperiod Control

Photoperiod lighting control is used to manage the day length, usually to induce or prevent flowering. Compared to supplemental lighting the light intensities required are much lower and can be achieved with tungsten or compact florescent lamps. Ordinary tungsten

Continued on page 2

Take Control With Argus

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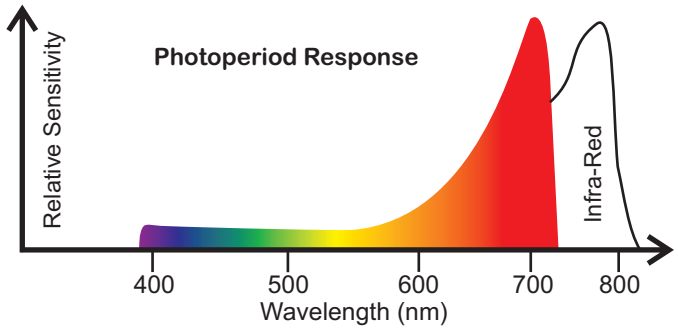
lamps work well because they emit a lot of red and far red light which plants are the most sensitive to for a photoperiod response.

To extend the day period beyond the natural day length, the lights are set to operate for a period of time before dawn or after dusk. Some crops also respond to a period of illumination in the middle of the night (night break lighting).

Traditionally, photoperiod lighting control was achieved with time clock relays. However, they often needed frequent adjustment to match the changing times of dawn and dusk.

By operating your photoperiod lights with your Argus system you can automatically tie the start and end times to an offset from dawn or dusk. This way you don't need to operate the lights any longer than required. For example, if the natural day length is gradually lengthening, the lights can be set to come on for just the time needed to maintain the required day length. Each day they will come on for a little less time than the day before. Likewise, if the days are getting shorter the system can automatically extend the on time of the lights to maintain the required day length.



Supplementary Lighting

Supplementary lighting control is typically used to operate HID (high intensity discharge) lighting systems whenever the ambient light levels are insufficient for the desired plant response.

The high capital cost and electrical energy demands of HID systems makes it important to manage them efficiently. With the Argus system you can control the operation of HID light systems based on a number of criteria including:

Time of day - fixed times or relative to dawn/dusk.

Sensor based operation - operate the lights only when the ambient light falls below a set threshold.

Short cycle prevention - different on/off light thresholds to avoid cycling the lights too frequently in variable weather.

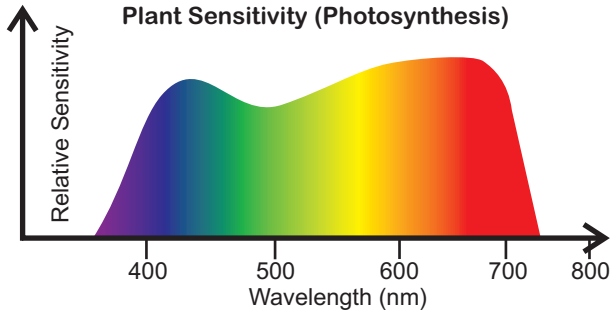
Light accumulation overrides - as soon as a minimum amount of light energy has been accumulated during the day, further operation of the lights can be suspended to save energy and extend the lamp life.

Minimum off times - this prevents short cycling of lighting equipment.

Additional overrides, limits, and operating logic can be added as required.

In some regions, electrical power may be available at off-peak rates. Provided your crop can benefit from lighting at these times, it is easy to configure your Argus lighting programs to take advantage of lower electrical rates.

These options enable you to maximize the value of your supplementary and photoperiod lighting investments while keeping costly electrical energy expenditures to a minimum.



Further Reading:

Light and Lighting Control in Greenhouses - Argus Control Systems

Evaluating Supplemental Light for Your Greenhouse - Ohio Florist's Association Bulletin May 2001

Supplemental Lighting on Bedding Plants – Making it Work for You - Ohio Florists Association Bulletin, November/December 2006

Supplemental Lighting for Greenhouse Crops - P.L. Light Systems, Inc., Beamsville, Ontario, Canada.

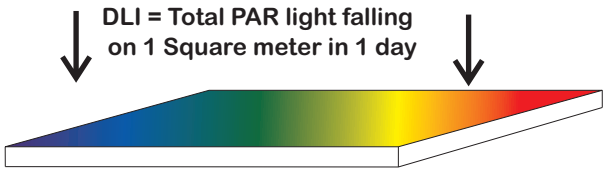
Measuring Daily Light Integral (DLI)

The Daily Light Integral is a fancy term for describing how much useful light your crop receives each day. It is calculated by measuring and accumulating the PAR light (photosynthetic active radiation) that your crop receives. To do this accurately you need a quantum light sensor mounted indoors at crop height in a representative area of your crop (not under a truss, gutter, or other light obstruction).

Typical indoor values are from 5-30 $mol \cdot m^{-2} \cdot d^{-1}$, (moles per square meter per day) depending on your area, the current weather, and the time of year. Most crops need at least 10-12 $mol \cdot m^{-2} \cdot d^{-1}$ on average, although this varies considerably between species. DLI is important, because there is a point below which photosynthesis, flowering, and overall plant growth begin to decline dramatically.

You can use DLI information to evaluate the need for and effects of shading and supplemental lighting. For example, if your crop is well ahead on average DLI, there may be little or no benefit to operating the lights on the odd dull day. Likewise, you may find that at times, your shade materials are reducing the DLI by too much to maintain optimum growth rates.

There are quantum sensors available with options for calculating DLI. You can also connect a standard quantum sensor to your Argus system to have it record and accumulate PAR values as well as calculate the DLI. You can then use this information to make crop management decisions.



Further Reading:

DLI Measurements: A Valuable Addition to Your Toolbox Greenhouse Product News January 2004 - Jim Faust

Daily Light Integral Defined Greenhouse Product News November 2006 - Erik Runkle

Conserving Water with Argus

If you use your Argus system for irrigation, there are many features you can use to conserve water and minimize runoff. Here are a few:

Pulsed Waterings - use the pulse settings in Irrigation Decisions to divide each watering into a number of shorter intervals with a configurable 'soak-in' interval in between. This can reduce overall water use and help reduce runoff, particularly in container crops.

Accumulation Decisions - Instead of timed waterings, try using light accumulation to better match the frequency of waterings with the actual demand for water.

Sensor-Based Irrigation - Your Argus system supports a wide range of moisture sensors and other measurement devices such as weight scales for measuring water loss. They enable you to closely match irrigations to the water demand.

Feed/Clear Water Selection Settings - You can help minimize salt accumulation problems by selectively feeding clear water at given intervals, or during high temperatures when the need for water replacement in the plants far exceeds the need for fertilizer salts.

Dynamic EC levels - With heavily leached or recirculated crops such as greenhouse vegetables it is possible to alter the feed strength (EC) throughout the day based on factors such as light, temperature, VPD, or the measured EC of the leachate. It is also possible to create mathematically weighted combinations of these factors.

Evapotranspiration Modeling - The new Titan system contains a full Evapotranspiration Model program designed for efficiently watering outdoor crops.

Help for Energy Efficient Investments

If you are considering investing in energy efficiency there may be local or national incentive programs you can take advantage of. These programs could include grants, low interest loans, and a variety of tax incentives to assist you with investing in energy efficient practices and equipment.

In the US
A good place to start is: www.farmenergy.org. This website provides "information on the Energy Title programs of the Federal Farm Bill and energy efficiency and renewable energy opportunities that benefit farmers, ranchers and rural communities".

In Canada
Check out incentive programs at the Office of Energy Efficiency: http://oee.nrcan.gc.ca/

If you are designing or researching innovative energy systems as part of your business R&D activities you may also qualify for federal tax credits:
http://www.cra-arc.gc.ca/taxcredit/sred/

After Hours Support

Argus provides emergency technical support 365 days a year, 24 hours a day.
Our business hours are 8 AM to 4:30 PM, Monday to Friday, Pacific Time (a 3-hour time difference from the Eastern US & Canada).

Whenever you call outside of these times, or on a designated Canadian national holiday, you can either leave a message for non-urgent matters, or have an on-call Argus technician paged in an emergency.

To have an Argus technician paged, call our toll free (US and Canada) service number: 1-888-667-2091 and follow the prompts. When leaving a message, please state your name and contact number, and if possible, a brief explanation of the problem. An Argus service technician will return your call as soon as possible. If parts are required, we try to forward them the next day or as soon as couriers are available. If, for some reason, you encounter a problem getting through on the toll free line, you can dial the direct pager number: 1-604-667-3616 Please use this number ***only*** if you are unable to leave a message on the toll free line.

New Date for Switching to Standard Time

Just a reminder that in most of Canada and the US, Daylight Saving Time ends this year at 2:00 a.m. November 4 (the first Sunday in November. It resumes again on the second Sunday in March. Make sure your control system is set to match these dates. Other parts of the world such as the EU and Asia use different dates. For more information see: http://webexhibits.org/daylightsaving/g.html

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