

# Creating a natural setting for your flocks with artificial lighting

With more and more farmers turning to environmentally controlled houses, the demand for artificial lighting has become a critical component in creating a natural setting for livestock to thrive.

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Regularly occurring daily cycles of light (day) and darkness (night) have been known to exert a profound influence on the behaviour and metabolism of many organisms.

Each daily cycle inclusive of a period of illumination followed by a period of darkness is called the photoperiod.

Besides the ability to control the photoperiod, we can further enhance this environment by controlling intensity (Lux), replicating dusk and dawn, using optimised colours (Kelvin) and enhancing uniformity.

## Dusk to dawn

A gradual change from light to darkness appears important to poultry as a cue for the oncoming dark period. The length of the dusk period should allow the birds to fill their crop for the night and find an appropriate place (perch or ground) to settle for the night.

In the wild, fowl have been shown to fly onto their perches 30-60 minutes before darkness, although even much shorter periods of artificial dusk (5-10 minutes) have been shown to be beneficial to laying hens in experimental studies.

The optimal length of the dusk and dawn period needs confirmation but, for now, the norm is about 30 minutes.

## Keeping within the law

The EU directive on laying hens (CEU 1999) states that 'a period of twilight of sufficient duration ought to be provided when the light is dimmed so that the hens may settle down without disturbance or injury'.

DEFRA also recommends provision of a period of dusk to facilitate roosting in laying hens, particularly in alternative systems with perches.

## Getting it right

So now we know what we need, how do we achieve this? Getting the Lux, uniformity and Kelvin correct is relatively simple, but how do we replicate dusk and dawn?

The dimming of LEDs is notoriously troublesome, especially at low levels. LEDs are dimmed in two ways, analogue and Pulse-Width Modulation (PWM) dimming.

Analogue dimming of LEDs is the adjustment of the LED current.

Dimming 110/2320V LED lights with built-in drivers allows for dimming



from between 5 and 10% to 100% which is not enough for achieving the true dusk to dawn effect. It is also prone to compatibility issues resulting in flashing, buzzing and so on.

This form of dimming is not ideal for controlling long lines (as typically found in a poultry house) of low voltage DC lights as voltage drop is compounded, resulting in the lights in the back of the house dimming out before the lights in the front of the house.

PWM dimming is turning the LED current on and off for short periods of time. The on/off frequency must be faster than what the chicken's eye can perceive to not cause a flickering effect (typically over 100Hz).

The Sunbird dimmer pictured above uses high resolution PWM with more than 60,000 steps at just over 700Hz.

This allows for incredibly smooth and true dimming from 0-100% with a linear output. This makes true dusk to dawn dimming possible.

Any dimming percentage much above 0% and it will be more like mid-morning to late afternoon dimming and not true dusk to dawn.

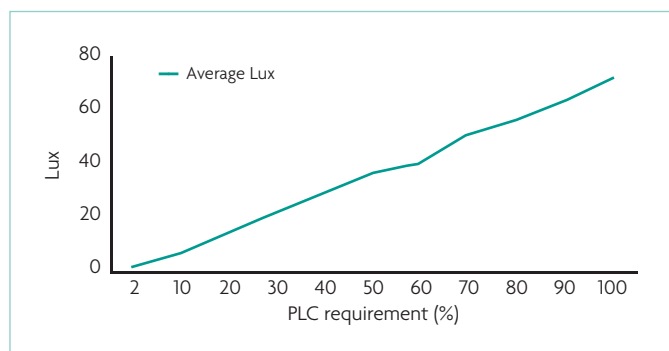
## The dimmer, timer and PLC

In an environmentally controlled poultry house, lighting and other activities are controlled by a PLC or environmental computer. These PLCs control everything in the house from ventilation, to temperature, feeding and, of course, lighting. The PLC generally has 0-10V outputs and the various devices in the house are controlled by changing this voltage.

In our case, 0V would be OFF, 5V would be 50% (35 Lux in Fig. 1) and 10V would be 100% (70 Lux in Fig. 1).

This voltage can be set in decimals to create a smooth and linear dimming output, if the PLC/dimmer permits. Most LED dimmers do not have a linear output which makes the setting of a PLC to perform dusk to dawn dimming extremely difficult.

Fig. 1. Linear dimming with Sunbird lighting.



## That grey area

Based on the above, you may ask how it is possible that every second poultry lighting supplier is claiming 0-100% dimming when most of them are using analogue technology?

The answer is simple. Yes, they do dim from 0% (off) to 100% brightness but they neglect to mention that the lights only react at a percentage far greater than 0% in relation to full power, normally between 5 and 10%.

## Conclusion

Control is everything, especially in an environmentally controlled house. Make sure your lighting system works seamlessly with your controller.

Simplify your life by insisting on a linear dimming curve and make sure that the dimmer does in fact dim from 100% smoothly down to 0% and visa versa if you want to enjoy the benefits of dusk to dawn dimming.