

# Tech-Tip



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## Using a Lighting Controller to get the Most out of your LED Based Lighting

### The LED Advantage

LED lighting offers many advantages including ease of use, excellent flexibility of design, medium to high intensity output (depending on the type of LEDs used), long life and very good reliability and repeatability – all major benefits when putting together a vision system.



### The Weakest Link

All too often however, LEDs are powered using a simple 12v or 24v dc power supply. This might seem like an adequate solution because the simplicity of connecting a power supply just produces light. However, this 'simple' solution represents the lowest common denominator and fails to take some important issues into consideration, nor does it provide any protection against accidental damage to the LEDs.

### A Better Solution

Simple power supplies are fairly 'dumb' devices and are unable to do anything other than turn the LEDs on or off. To exploit the full potential of your LED lighting system, a better method is needed – one which can provide more functionality.



#### GERMANY

**STEMMER IMAGING GmbH**  
Gutenbergstraße 9-13  
82178 Puchheim  
Phone: +49 89 809020  
Fax: +49 89 80902116  
info@stemmer-imaging.de

#### UNITED KINGDOM

**STEMMER IMAGING LTD**  
The Old Barn, Grange Court  
Tongham, Surrey, GU10 1DW  
Phone: +44 1252 780000  
Fax: +44 1252 780001  
info@stemmer-imaging.co.uk

#### FRANCE

**STEMMER IMAGING S.A.S.**  
23 bis, rue Edouard Nieuport  
92150 Suresnes  
Phone: +33 1 45069560  
Fax: +33 1 40991188  
info@stemmer-imaging.fr

#### SWITZERLAND

**STEMMER IMAGING AG**  
Rietbrunnen 48  
8808 Pfäffikon SZ  
Phone: +41 55 4159090  
Fax: +41 55 4159091  
info@stemmer-imaging.ch



## Lighting Controllers – The Preferred Solution

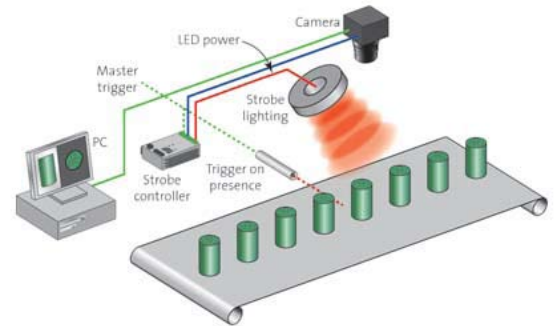
By using a lighting controller to power the LEDs, a range of additional benefits can increase their usefulness. Lighting controllers represent a cost effective way of getting more from your lights and applications. Here are some typical real-world examples:

### Strobing

Benefits:

- Extend LED life
- ‘Freezing’ fast moving events

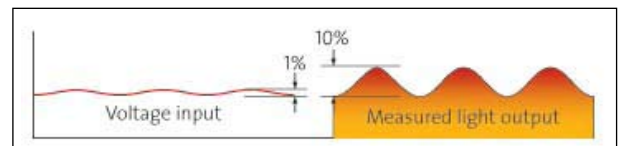
LEDs offer a long service life – 30,000 to 50,000 hrs depending on how they are used - but quite often the light is only required at a specific moment when the camera is required to capture an image. Running LEDs continuously can needlessly reduce their life span and a lighting controller can extend this by simply switching the current off when the light is not required. This can increase LEDs life span by a factor of x2 or more depending on the application.



### Lighting Stability

Benefits:

- Provides accurate and repeatable intensity control
- Simplifies and speeds up the inspection
- Increases the inspection reliability



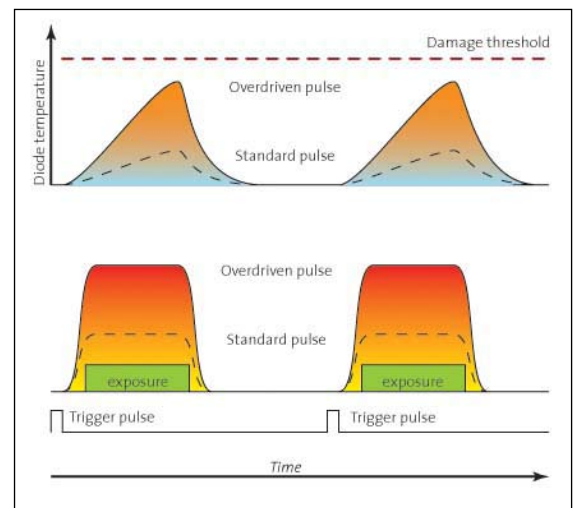
Simple power supplies regulate current indirectly by controlling the applied voltage. A 1% variance in the voltage across an LED can cause a 10% variation in the current flow, thus creating a potential 10% variation in output intensity. Simple voltage regulated power supplies can allow a voltage ‘ripple’ which can be seen on an image to image basis. By controlling the exact intensity of the LED illumination, lighting controllers can simplify the inspection process by maintaining an even level of illumination which will result in better image acquisition. With fluctuating light levels, the inspection software will have to work harder to compensate for differences in the images, but keeping the lighting stable will result in faster processing times and more reliable inspection results.

### Overdriving

Benefits:

- Increases light intensity
- Provides lighting timing control

Overdriving refers to the technique of increasing the current to an LED above its stated continuous maximum in order to achieve a very intense but short duration pulse. This can be used to ‘freeze’ the action in a fast moving situation such as when strobing the lighting on a conveyor belt to coincide with the passing objects, or capturing an image of a very fast, short duration event.



A lighting controller can manage the precise duration of the lighting pulse and the 'rest' period in which the LED is allowed to cool, ready for the next pulse. This is important because unless sufficient time is allowed for cooling, the LEDs may overheat and fail prematurely.

### LED Lighting Protection

Benefits:

- Protect against accidental LED damage

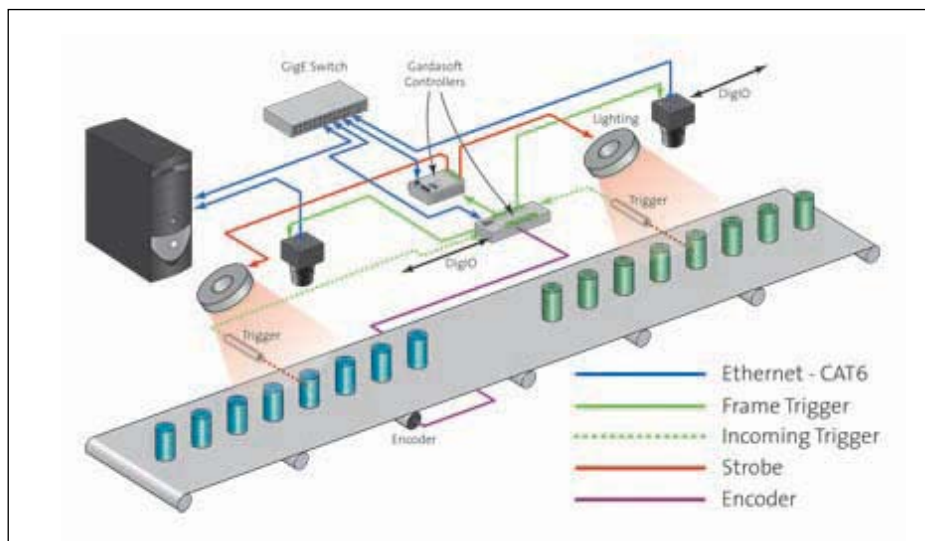
Accidents can happen, and if the LED lights are connected incorrectly, or if a power surge occurs, the lights may be damaged. Some lighting controllers such as those from Gardasoft can provide protection against damage to the LED lights themselves. These controllers can protect against over current and reverse polarity, while allowing an LED lighting system to be overdriven safely.

### Camera Trigger and System Wide Control

Benefits:

- Provide camera trigger pulses for one or more cameras
- Provide frame grabber trigger pulses
- Control the timing of one or more LED lights
- Control strobe pulses, their duration and intensity
- Control multiple lighting set-ups for different inspections
- Link with an encoder pulse to synchronise events
- Control reject gates and other system wide events

Using a lighting controller that is linked to the rest of the vision system can provide accurate timing over the lighting but it can also be used to control many other events in a complex setup. Modern controllers such as those from Gardasoft can act as general system timing controllers, synchronising many different events in addition to the LED lighting.



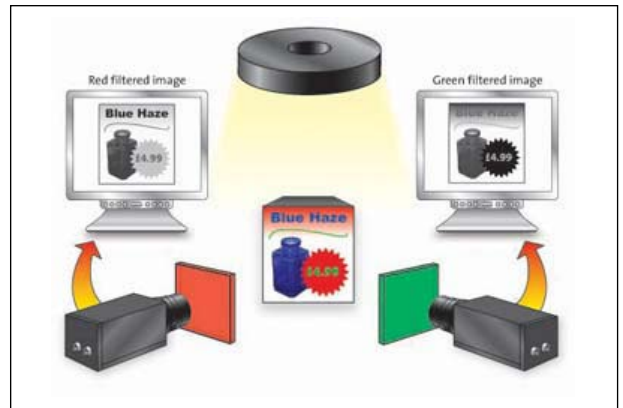
A system can be used to inspect different features at different times, therefore a controller can be used to switch between different lighting setups to capture different features of the same object. For example, a single object could be lit using dark field, low angle lighting to check for surface scratches and defects, while a second, diffused light



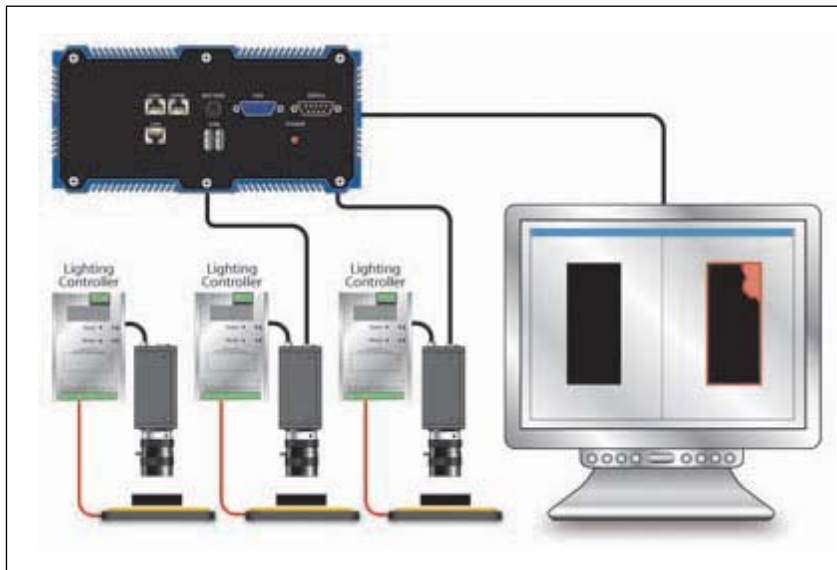
could be used after a timed delay for part presence verification before the object moves on.

Similarly, different coloured lights or IR/UV illumination could be timed to inspect a single object for different features.

These events could all be linked via a controller to trigger cameras or frame grabbers in a system. Likewise, conveyor belt encoder pulses can be integrated and reject gates can be timed and controlled via a central control system.



The latest generation of controllers also offer Ethernet connectivity and can fit very comfortably in a GigE environment and use the same cabling.



It should also be remembered that lighting controllers are equally well suited to factory floor vision solutions, where they can provide automated control over a range of lighting and control and can be easily integrated into a system like the one shown here.

**Conclusion:**

Lighting and timing controllers can provide a wide range of benefits when

used in a modern machine vision system and act as a central control and synchronisation hub that sits happily in a modern GigE connected environment. If you use LED lighting in a machine vision system, a controller can provide a cost effective way of extending its use and adding extra functionality.

Chris Baldwin, STEMMER IMAGING, 2010