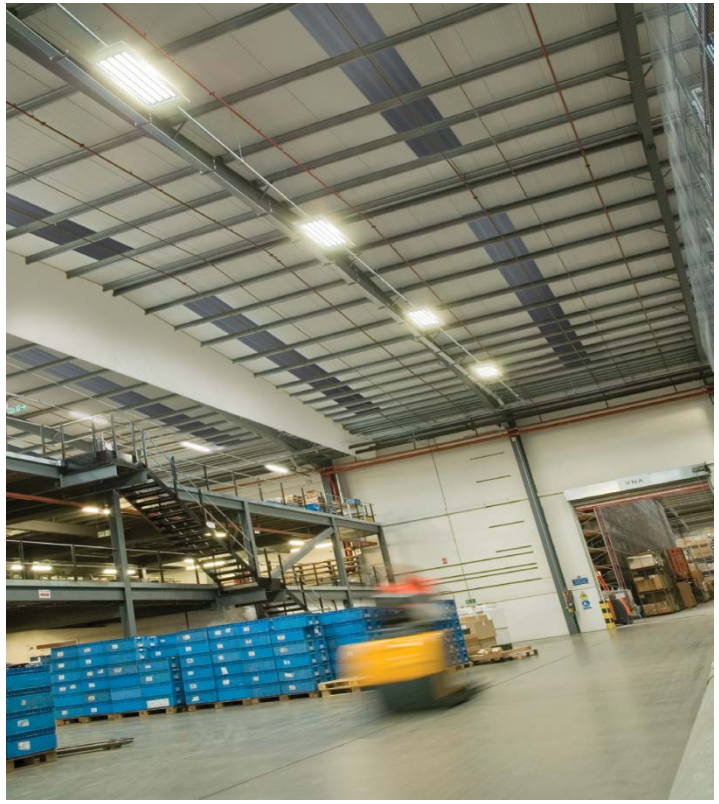


Lighting Control Systems

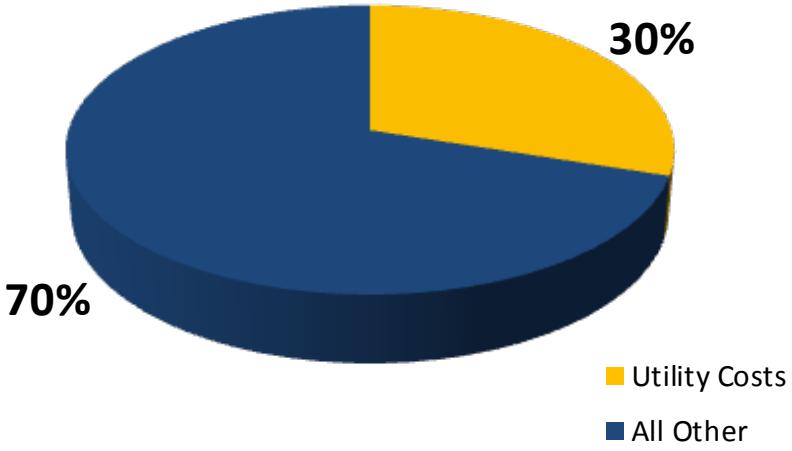
Thorlux Lighting Australasia

Overview

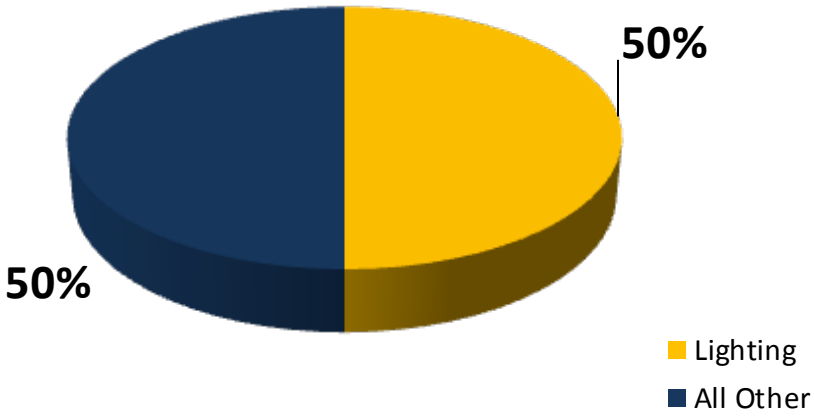
- Energy Usage
- What Is A Lighting Control System?
- General Types Of Lighting Controls
- Occupancy Sensors PIR (Passive Infrared)
- Daylight Harvesting
- Controls Terms
- Comparison Of Control System Types
- Case Study
- Conclusion

Energy Usage

Business Operating Expenses

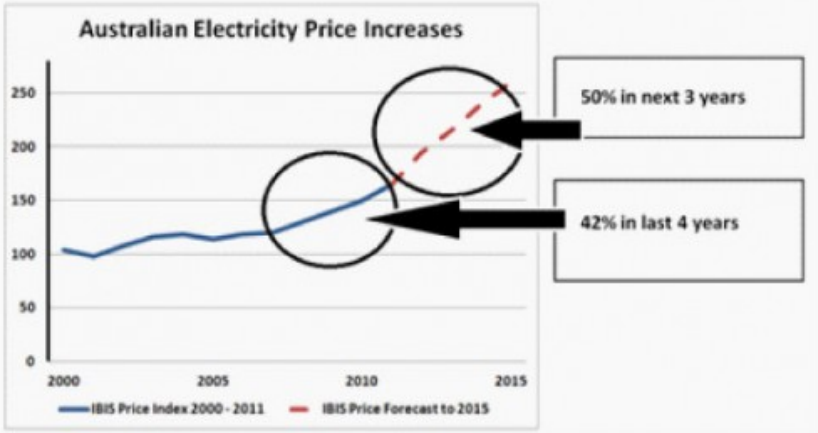


Typical Building Energy Costs



Energy Usage

Forecast **50%** price increase over 3yrs



Pressure to **reduce energy consumption** and **improve energy efficiency**

Energy Usage

Energy Usage Reduction?

- Simple Solution = Lighting Control System !
  - Reduce electricity consumption
  - Achieve real and significant savings
  - Maintain lighting levels

What is a Lighting Control System?

A lighting control system, simply put, consists of a device or devices that allow us to control electric lighting.

Devices Include

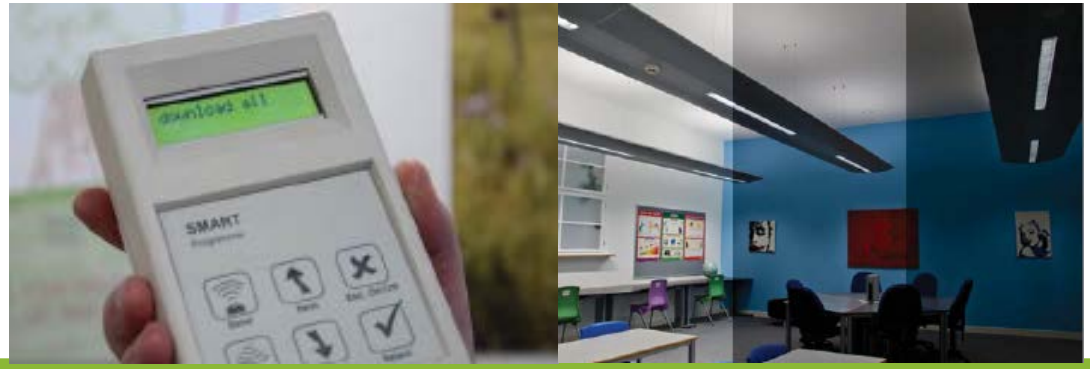
Light Switch

PIR

Scene Setting Controller

Daylight Harvesting Cells

What is a Lighting Control System?



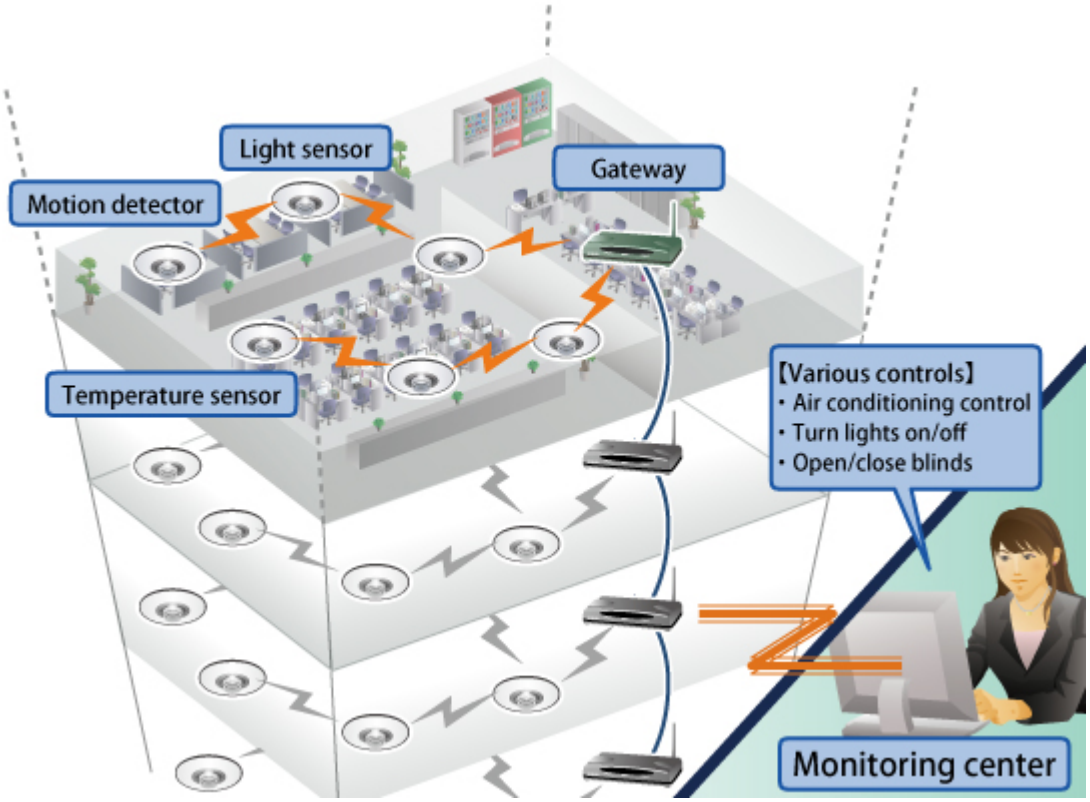
Functionality

- occupancy switching
- daylight harvesting
- maintaining lighting levels
- scene setting for everyday working environments
- aesthetic reasons
- security lighting (interior and exterior)

What is a Lighting Control System?

Benefits:

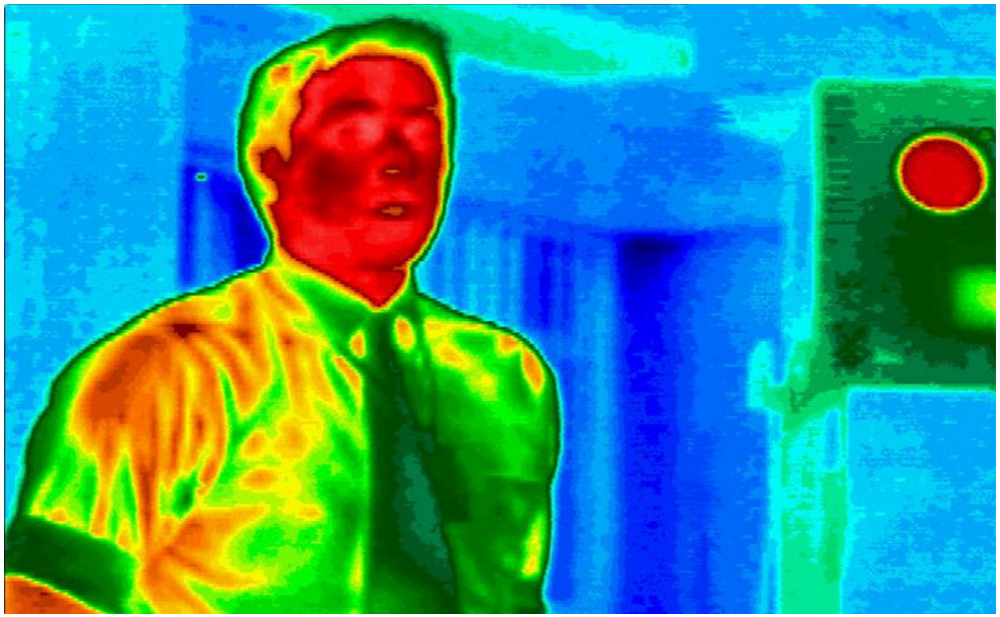
- Advanced energy management
- ability to remotely toggle (on-off) power to individual or groups of lights (and now ceiling fans, blinds and other devices)
- operate dimmers
- pre-program space lighting levels.



General Types of Lighting Control

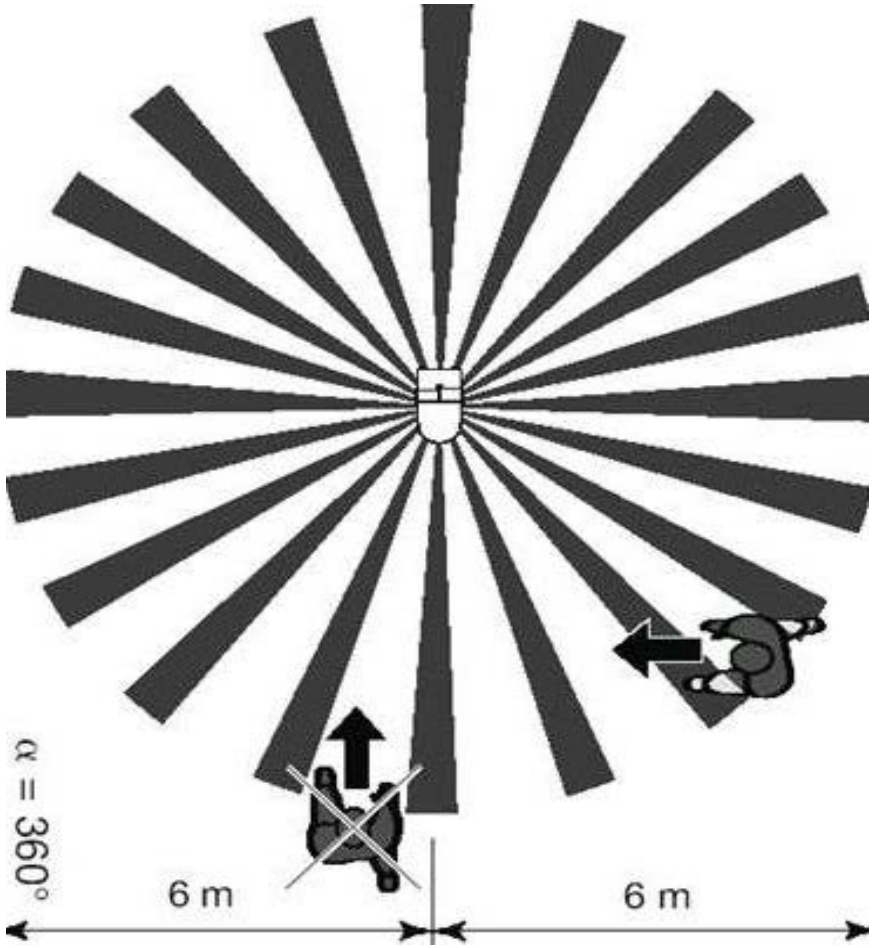
OCCUPANCY SENSORS

Occupancy sensors detect the presence or absence of people using one or a combination of several methods. The most popular method is passive infrared (PIR). PIR occupancy sensors sense the difference in heat emitted by humans in motion from that of the background space.



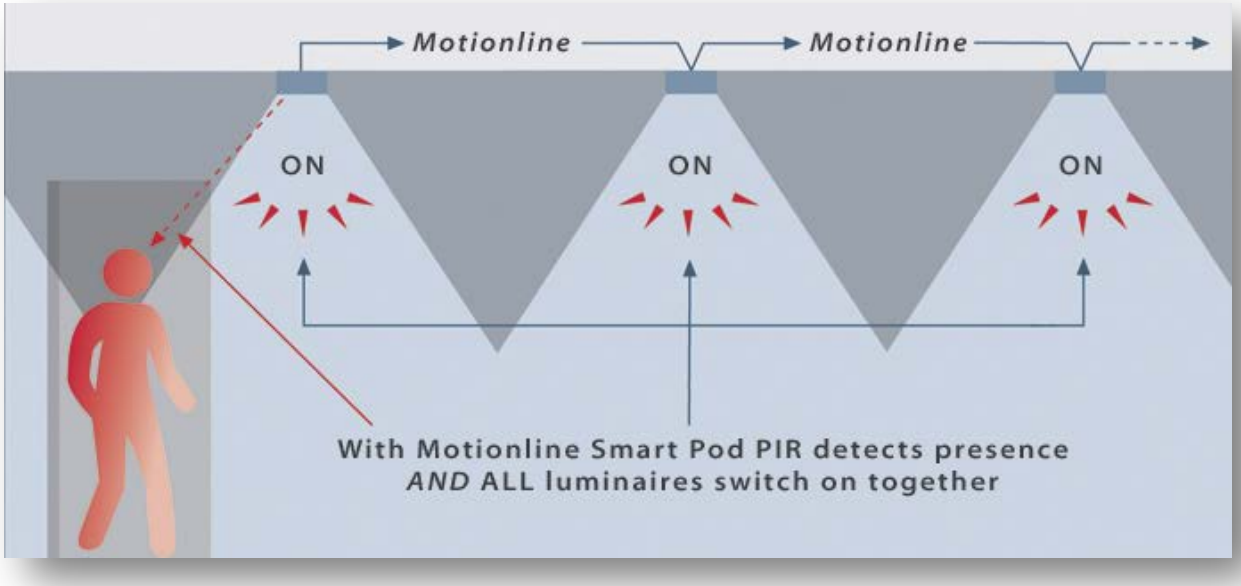
PIR

The sensor's lens views its coverage area as a series of fan-shaped coverage zones, with small gaps in between, and is most sensitive to motion that occurs between each zone.



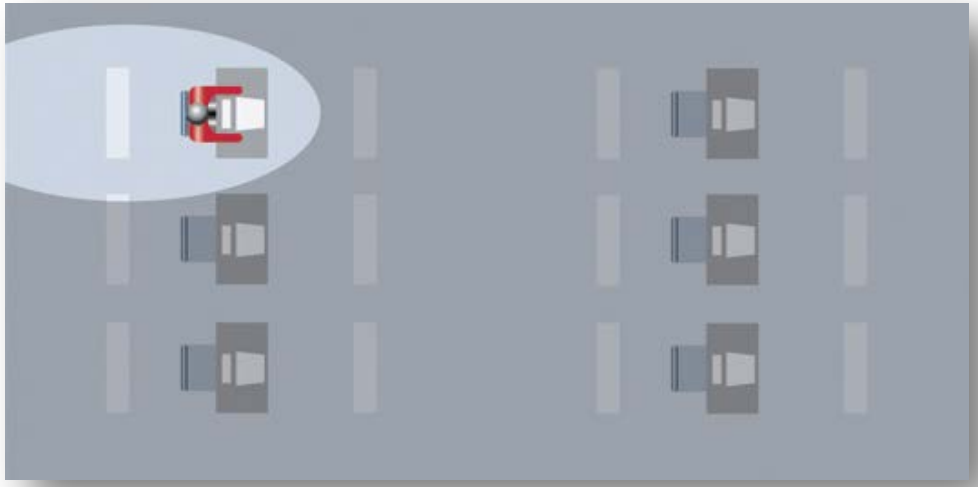
PIR Connection

2-WIRE MOTIONLINE INTER-CONNECTION

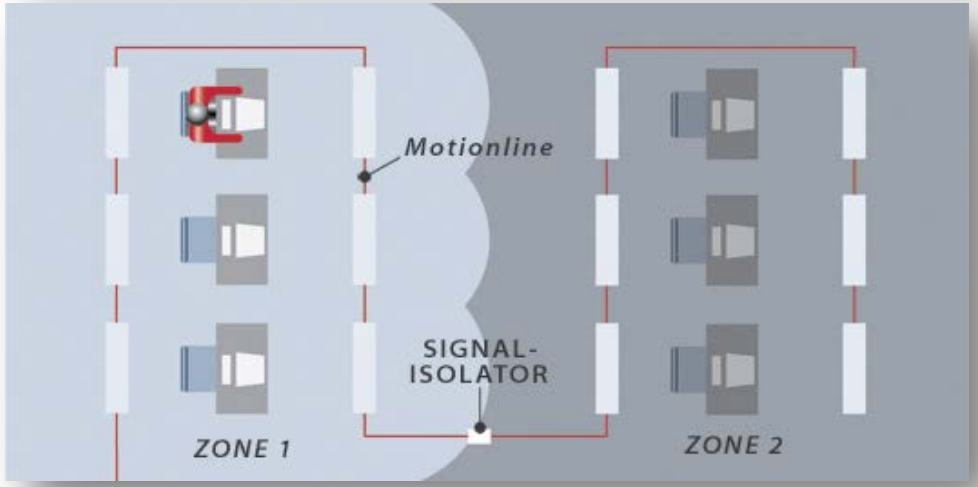


On the first detection the Motionline ensures that ALL luminaires in the zone communicate a presence and switch on together.

Without the Motionline luminaires operate independently, each one switching on in sequence.



No pools of light,
no plunging into total darkness. Luminaires dim down before switching off



Motionline maintains a comfortable working area as all luminaires in the zone are on

Potential Savings with PIR

In 1997 American researchers studied energy savings potential for occupancy sensors in buildings in 24 states representing a cross-section of commercial building types. The study monitored occupancy and the number of hours the lights were on in 158 rooms, including 37 private offices, 42 restrooms, 35 classrooms, 33 conference rooms and 11 break rooms. Potential energy savings for these spaces types were calculated as follows.

Space Type	Savings Potential 9am – 5pm
Restroom	20%
Conference room	29%
Private office	27%
Break room	16%
Classroom	26%

Daylight Harvesting

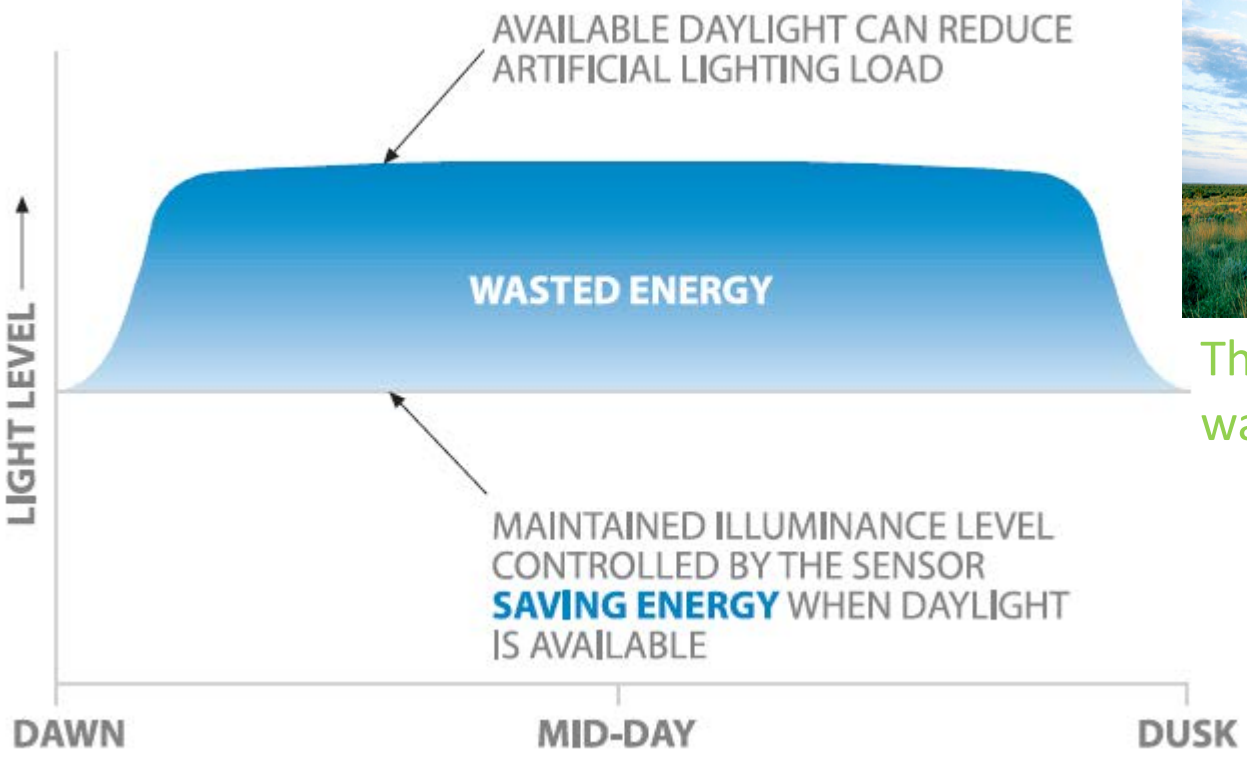
Daylight Harvesting

DAYLIGHT HARVESTING: MAXIMISING ENERGY EFFICIENCY

- The use of a control system to reduce the use of artificial lighting in building interiors when natural daylight is available.
- Used to ‘maintain’ set lighting levels.
- By using daylight harvesting technologies, owners can obtain an average annual energy savings of 40% +.
- Helps to meet green building ratings.
- The installation of a daylight harvesting controller enables the maximisation of energy efficiencies and the achievement of higher energy efficiency ratings.

Daylight Harvesting

DAYLIGHT HARVESTING: MAXIMISING ENERGY EFFICIENCY



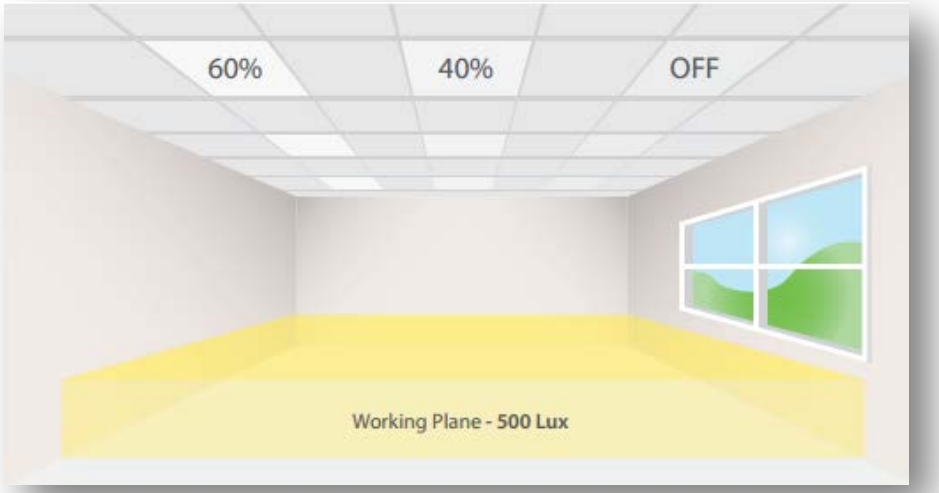
The Ayres Rock of wasted energy !!

Average Annual Energy Savings - >40%

Light Sensor Operation

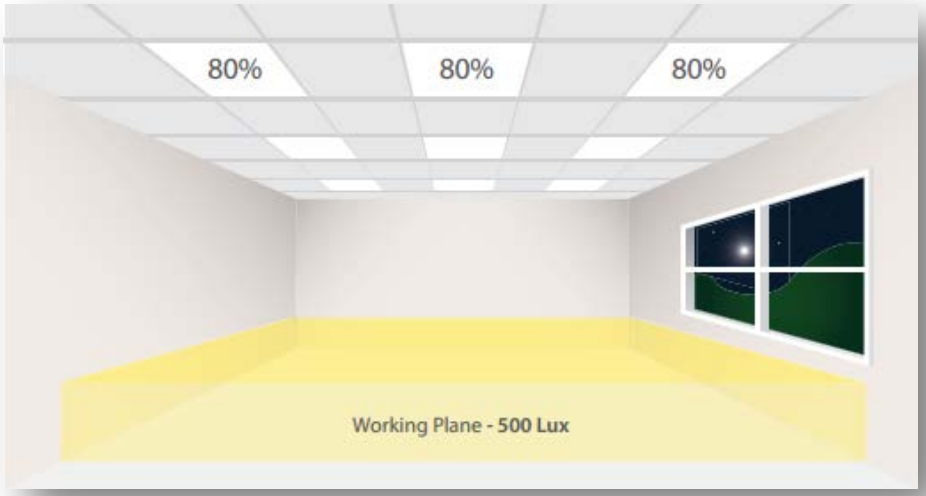
DAYLIGHT HARVESTING

Daylight from windows or roof lights is taken into account by the Daylight cell (cell in each luminaire) As daylight increases artificial light levels decrease.



MAINTAINED ILLUMINANCE SAVING

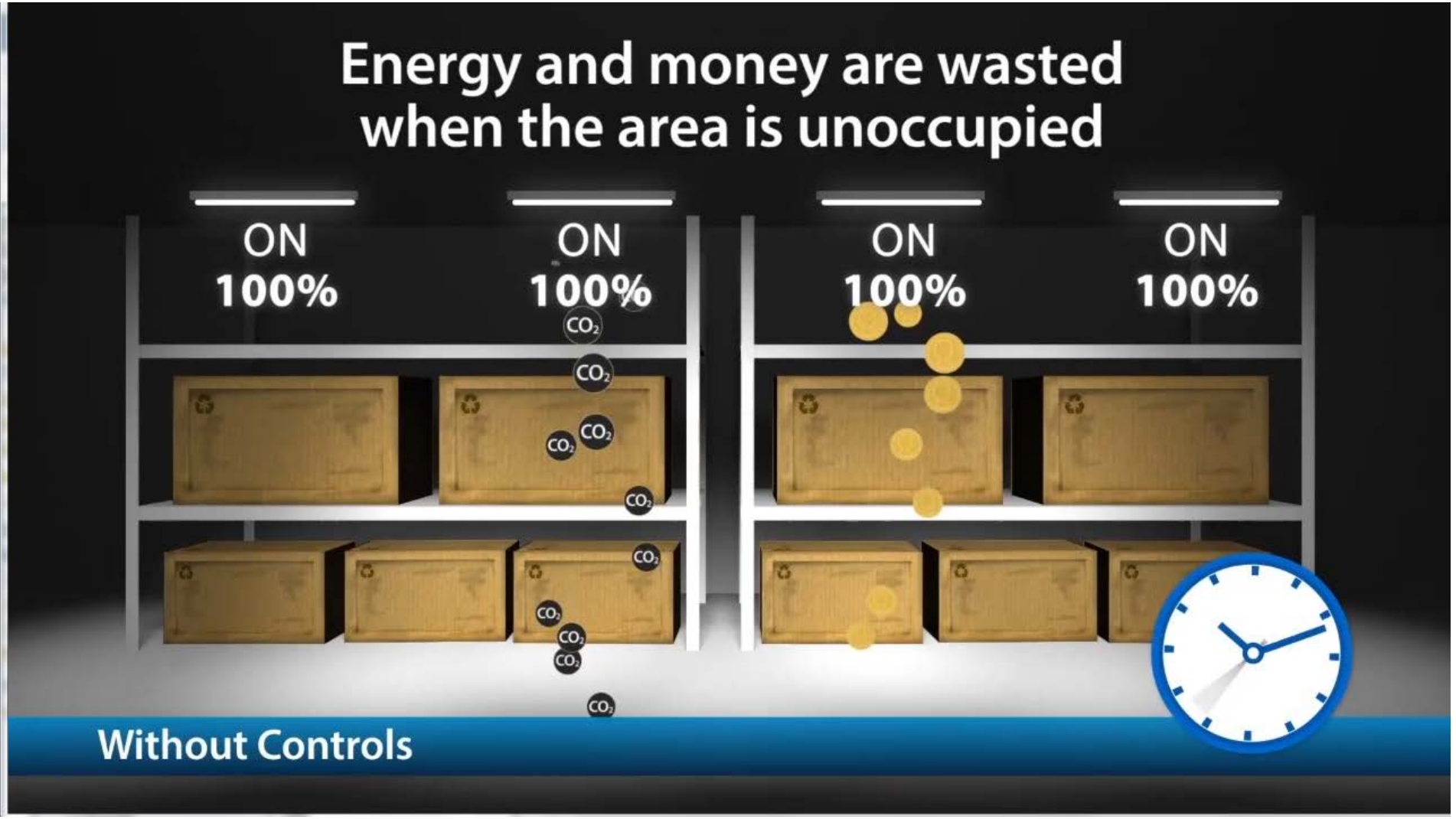
All professionally designed schemes should include a 'maintenance factor', this basically means schemes are 'over-lit' on day one to allow for lamp degradation and dirt build up over time. The use of a daylight harvesting system that can be set to give exact illuminance levels will also save this energy.



Thorlux Lighting
AUSTRALASIA PTY LTD

Warehouses have lots of luminaires and use lots of energy!

Without Controls


Energy and money are wasted
when the area is unoccupied
ON
100%
ON
100%
ON
100%
ON
100%
CO2
Without Controls

Thorlux Lighting
AUSTRALASIA PTY LTD

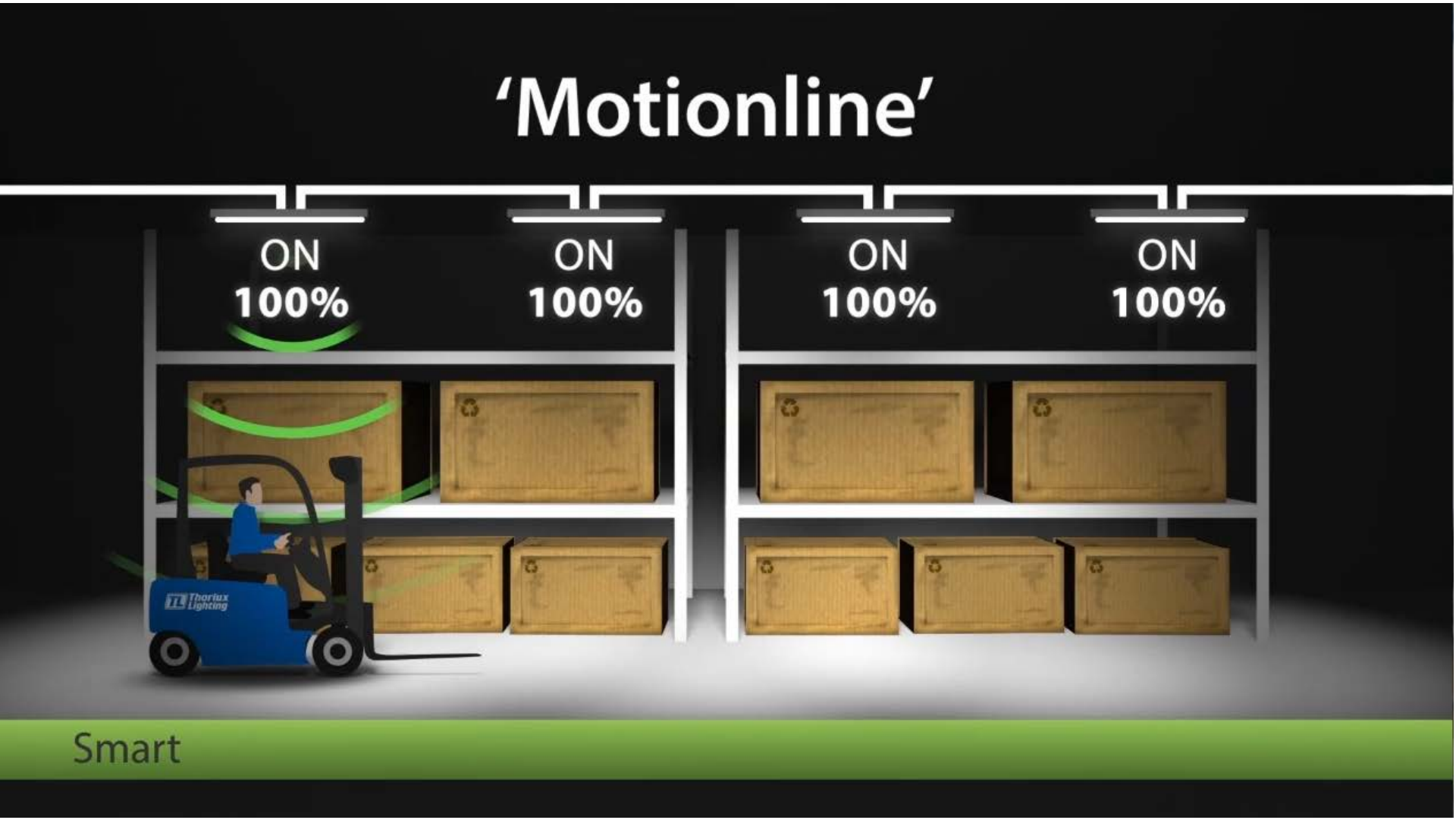
Basic Solution
Presence Detection

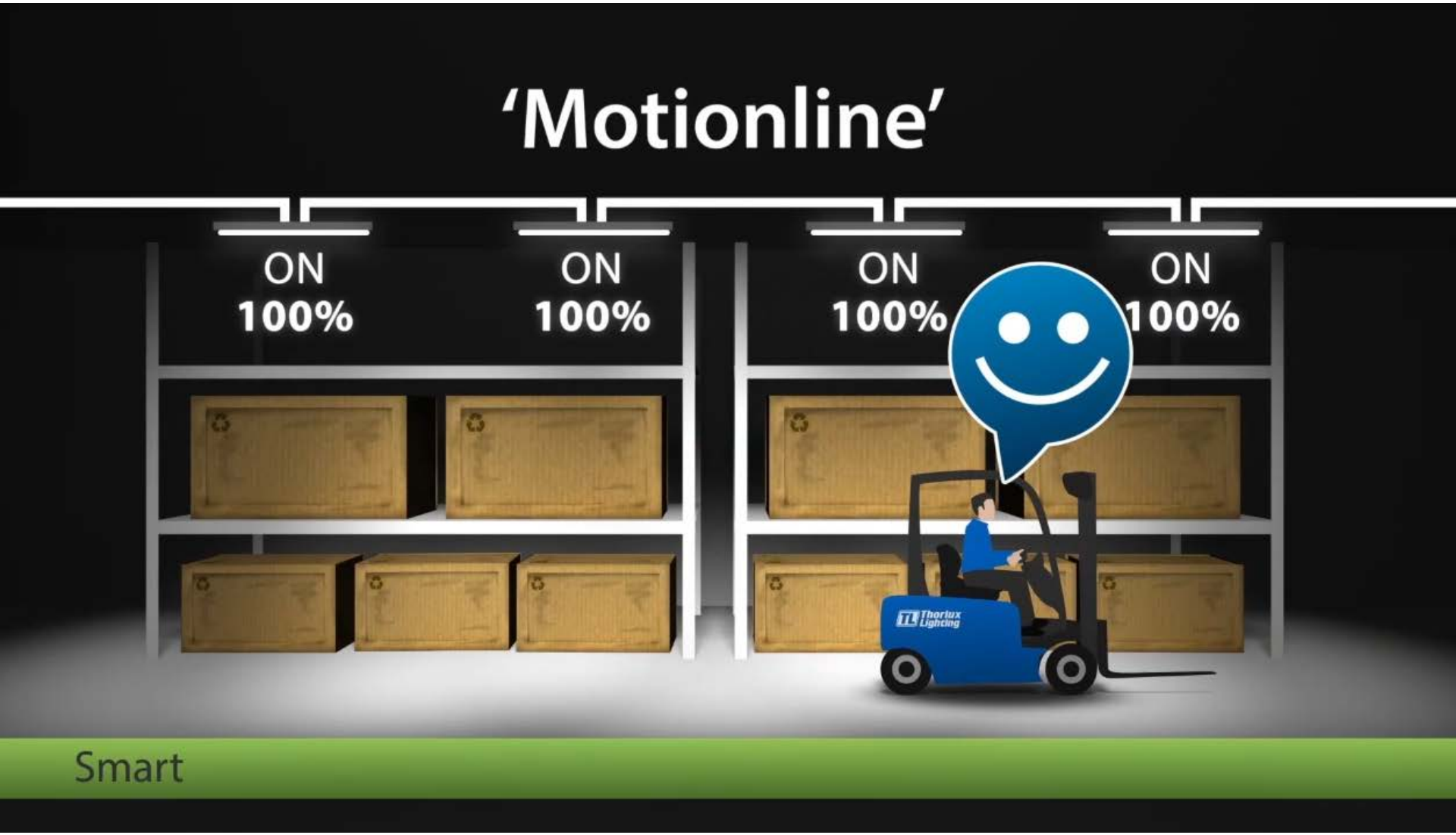

ON
100%
OFF
0%
OFF
0%
?!
Thorlux Lighting
Presence Detection

The Thorlux Way

Presence Detection + 'Motionline' =

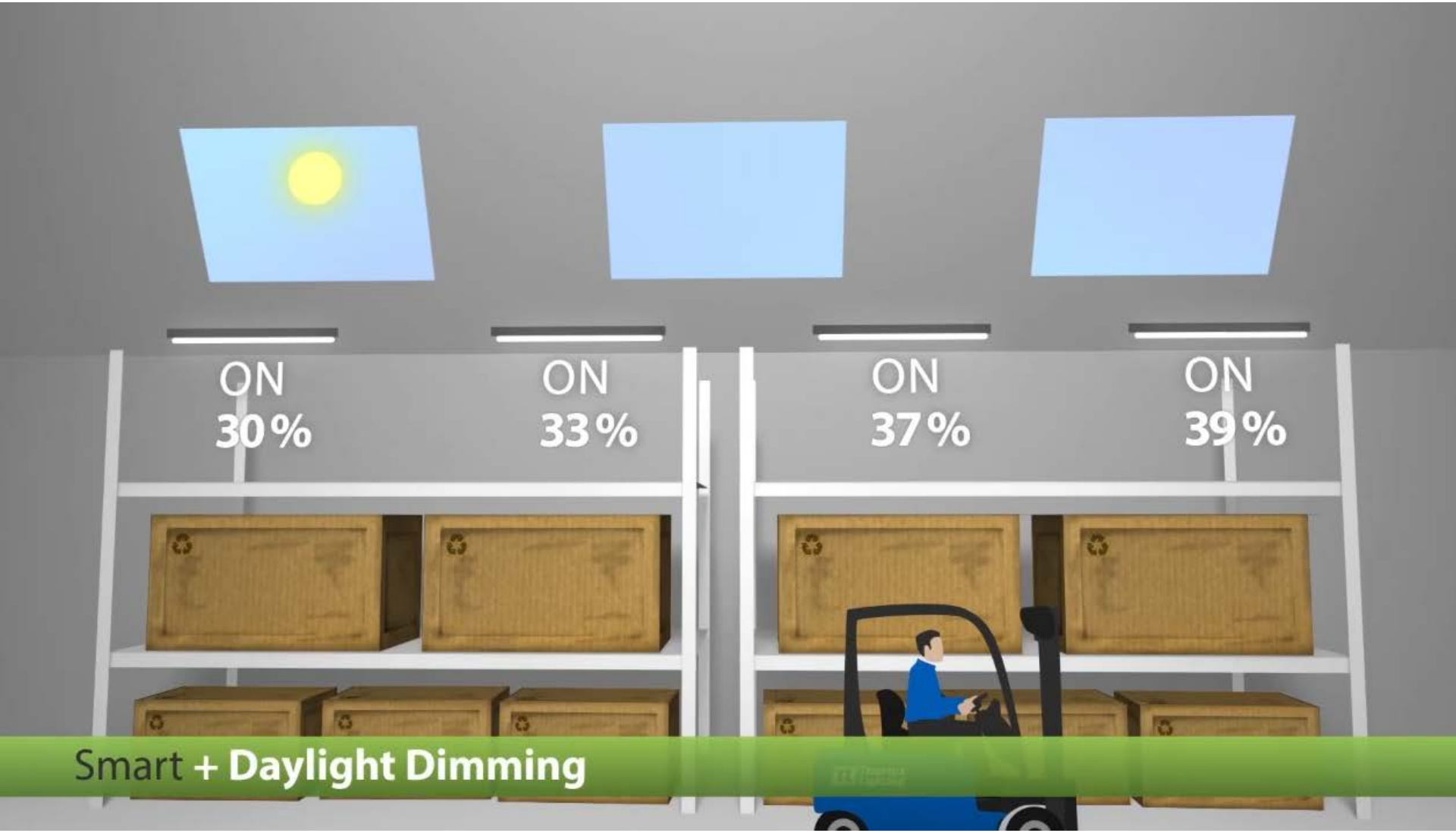
Smart

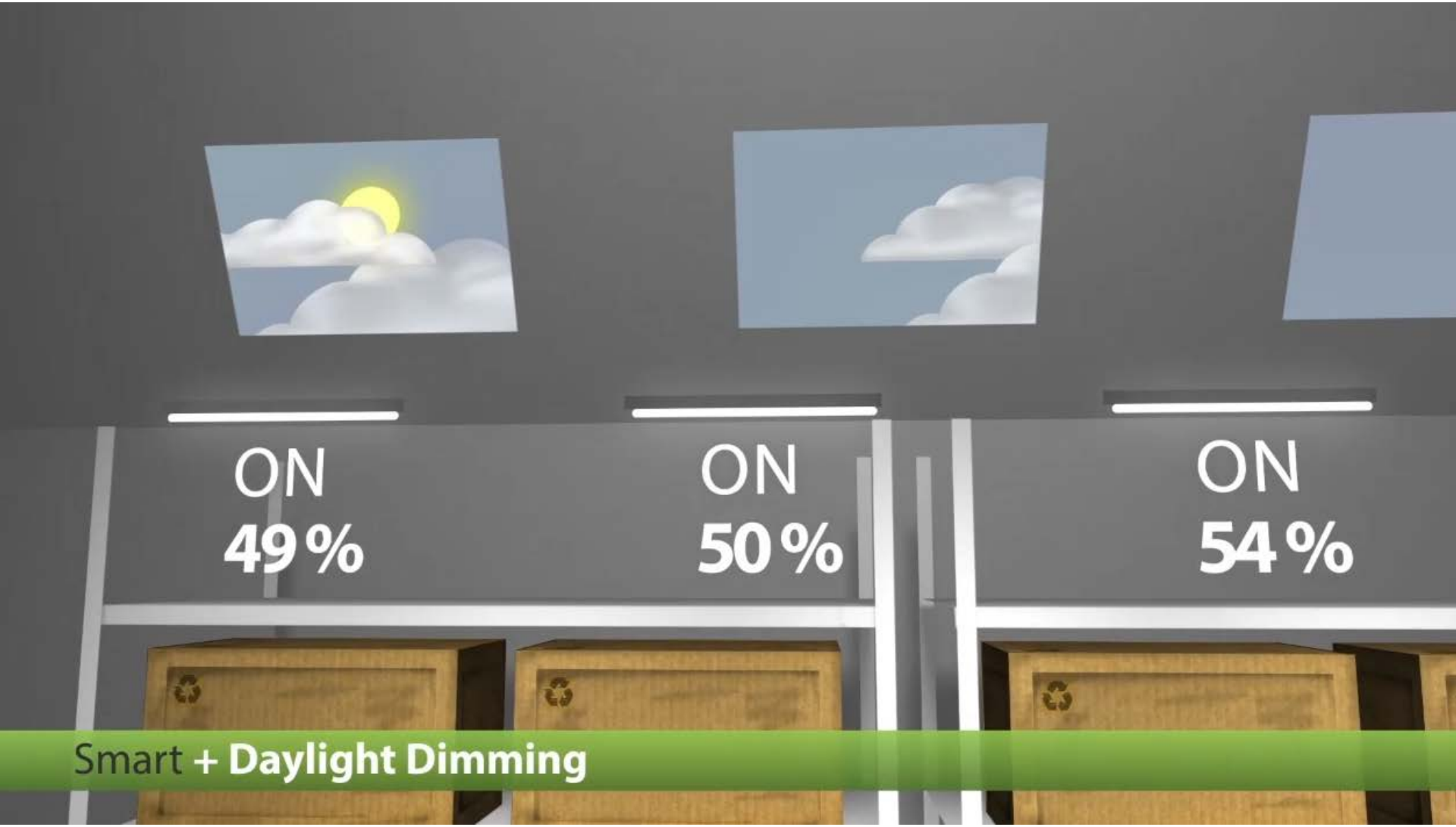

‘Motionline’
ON
100%
ON
100%
ON
100%
ON
100%
Smart


‘Motionline’
ON
100%
ON
100%
ON
100%
ON
100%
Smart

Smart

Also includes Daylight Dimming for even better energy savings


ON
30%
ON
33%
ON
37%
ON
39%
Smart + Daylight Dimming


ON
49%
ON
50%
ON
54%
Smart + Daylight Dimming

The Smart Solution

Energy Saved

CO_2 Reduced

Short Payback

User friendly

Controls Terms

- **1-10V** - This uses a DC signal connected to each luminaire and dims by varying voltage from 1-10v.
- **DSI** – (Digital Serial Interface), the precursor to DALI dimming systems, uses a digital dimming signal to DSI compliant devices.
- **DALI** - (Digital Addressable Lighting Interface) also uses a digital dimming signal to an ADDRESSABLE compliant device.
- **WIRELESS** – The new wave?!

The Pro's and Con's

CONTROL	PRO'S	CON'S
1-10V	Cost Easy to Install	Can only do group control Can suffer from voltage drop over distance Can suffer AC interference Polarity sensitive Needs a mains switch to turn off Only dims to 10%

The Pro's and Con's

CONTROL	PRO'S	CON'S
DSI	Reliable digital system Easy to install Not polarity sensitive Can be switched using control wire	Only one manufacturer

The Pro's and Con's

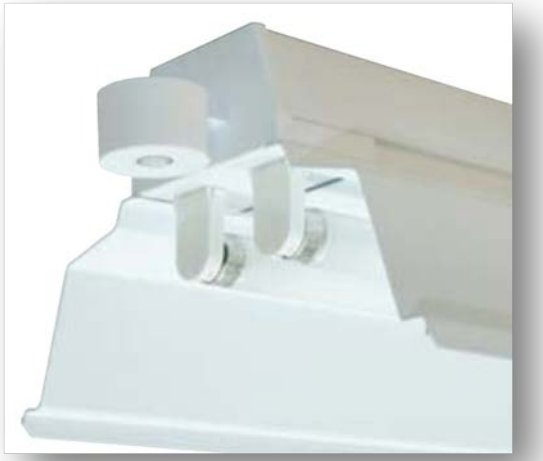
CONTROL	PRO'S	CON'S
DALI	Individually addressable fittings Digitally reconfigurable Not polarity sensitive Can be switched using control wire Scene setting available Luminaire feedback is available Compatibility between manufacturers	Can be complex to commission If ballast fails the whole system has to be reconfigured Information stored locally at ballast

The Pro's and Con's

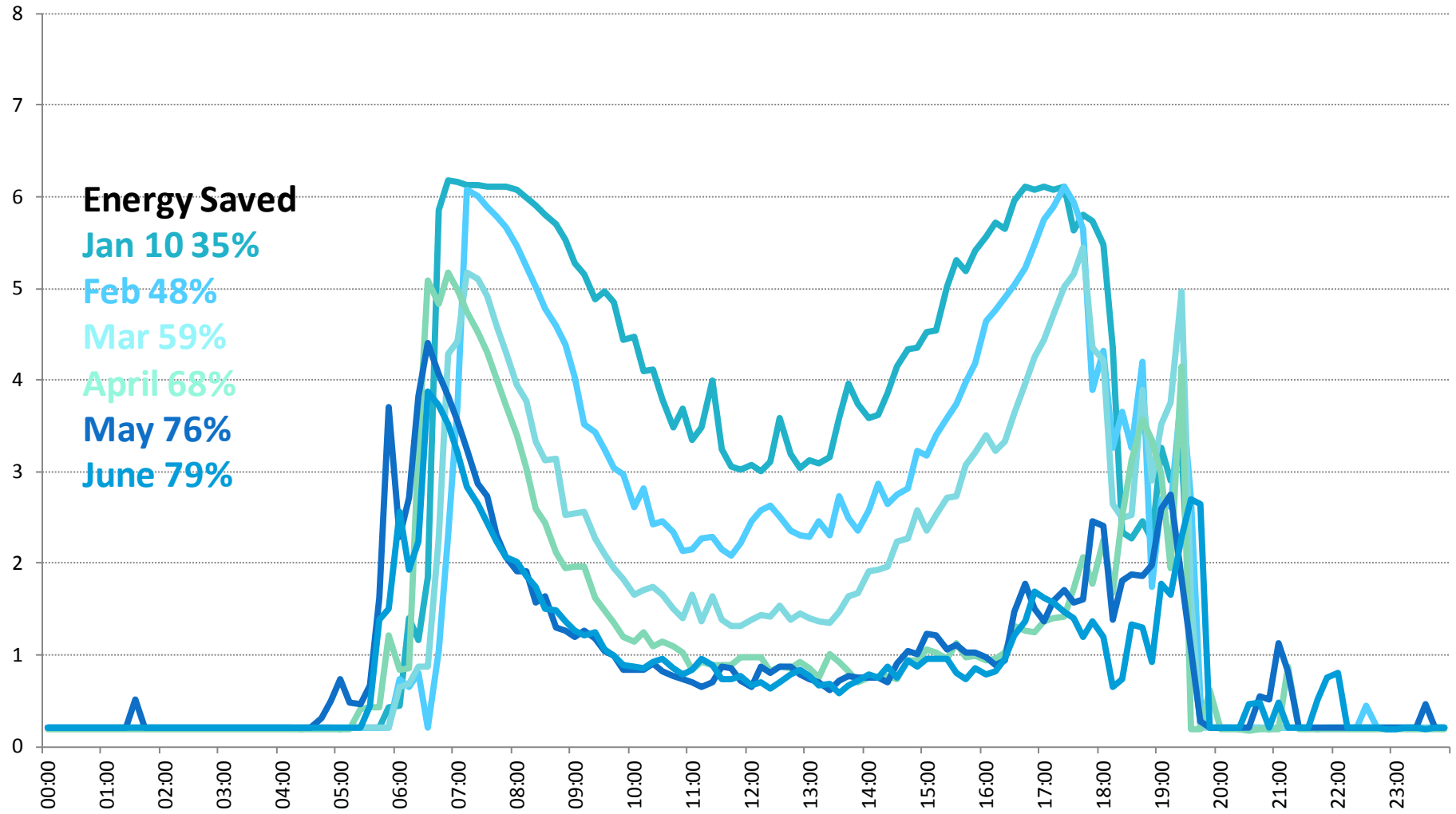
CONTROL	PRO'S	CON'S
WIRELESS	No cabling between controls	Still needs mains wiring Limited distance communication Signal cannot 'see' through objects Possible interference problems Will not be suitable with all luminaire types due to IR interference

Case Study – Thorlux Factory

- Re-lit in 2008
- Extensive Roof-lights
- Existing 2 x 58w T8 reflector luminaires refurbished with digital ballast, daylight cell and PIR



Average Power Consumption



Energy Savings Summary

	Original	T8 HF	New
Luminaires	644 qty 2 x 65w switch-start	644 qty 2 x 58w standard HF	644 qty 2 x 58w with daylight and PIR
Total Max Load	99.2 kW	70.8 kW	70.8 kW
kWh per annum	404,142	288,673	145,649
Annual Electricity Cost (based on 15c/kWh)	$60,621	$43,301	$21,847
Annual CO_2 Production	425,965 kg	304,262 kg	153,520 kg
% savings over original scheme		**30%**	**65%**

Conclusion

- **In our opinion building designers, architects, consultants and engineers should consider offering some form of controllability on all projects.**

- **Controls should form part of an overall lighting strategy, along with high efficiency lighting ballasts and luminaires, and pre-programmed lighting schedules.**

- Lighting controls can contribute significantly to saving energy.
- If designed correctly a control system can give a high degree of user satisfaction.
- Allows light to be provided in the right amount where and when it is needed.
- Gives us the ability to control individual light fittings, groups of lights or all lights together in a building or on a property from a single user interface device.
- Modern lighting controls provide users with flexibility, reliability.
- Daylight improves the internal environment has a positive impact on productivity and health and at the same time it can save energy.

Multiple ways to control lighting !

We can make it as complex or as simple as client requirements !!

Thank you and any questions?

Visit THORLUX Australasia's web page – http://www.thorlux.com.au