Dialight

LED Lighting – Save Energy and increase performance

Rail Interiors Expo 2008

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Today

- Overview of Dialight
- Reduced energy through lighting
- LED systems for linear lighting solutions
- Indirect scheme
- Direct scheme
- Retrofit scheme

- Summary & Questions

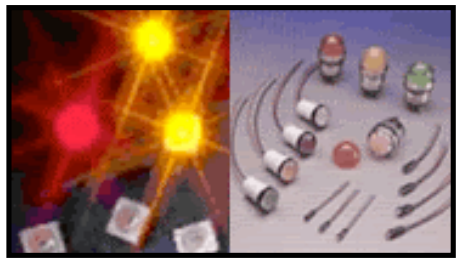
Leader in applied LED Technology

- Founded in 1937
- Listed London Stock Exchange (DIA.L)
- Revenue GBP 68 Million
- Operating Locations UK(2), Germany, USA (2), Mexico
- Markets which require, quality & reliability

Illumination

Signalling

Indication

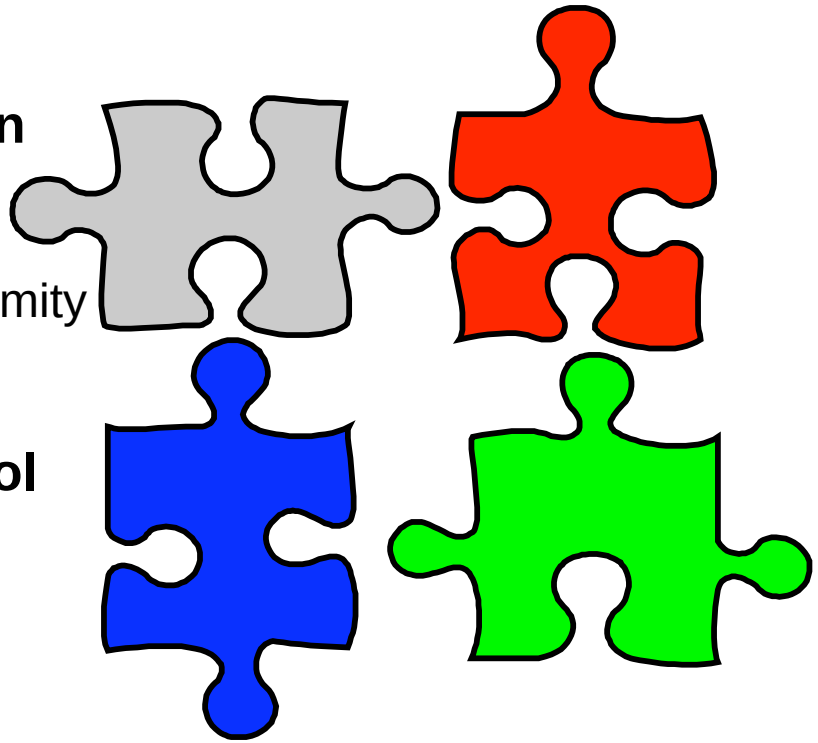


Saving Energy with lighting

Lighting Design

Regulations

Lux, Glare, Uniformity



Technology

LED, T5, Halogen

Lighting Control

PIR & Day light linking

Business Case

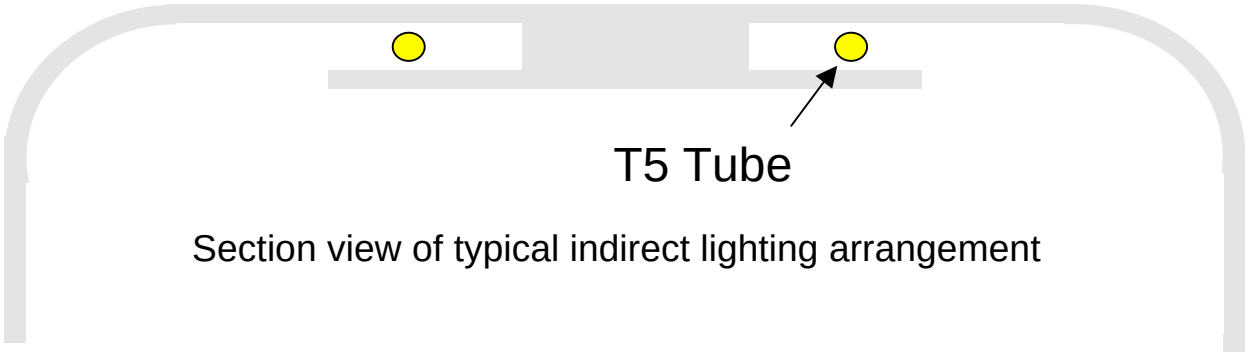
Return on investment. Energy savings, maintenance, safety improvements

…… Is not just about LED's

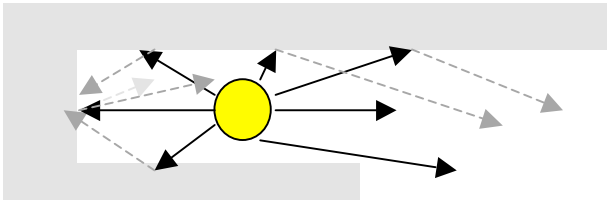
Rail Interior Illumination

- Linear Light sources majority of market
- T5 current “optimum” solution – 5000lm @ 94 Lm/ Watt ~ 46 Watts

Indirect Linear Lighting with T5 tubes



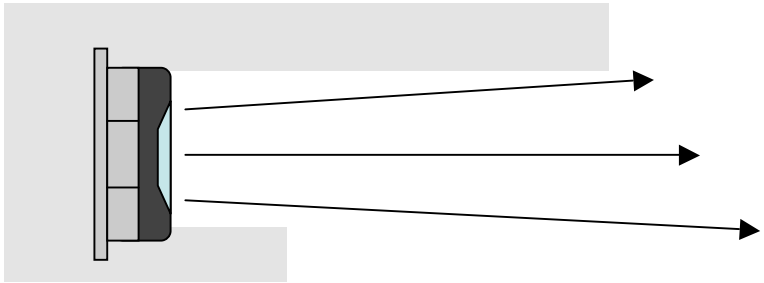
Section view of typical indirect lighting arrangement



Significant amount of light trapped – lower lighting efficiency

Difficult to clean – dust build up further decreases efficiency

LED Indirect lighting solution

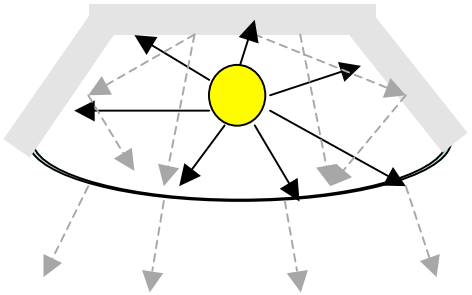


Powerwhite® Modules

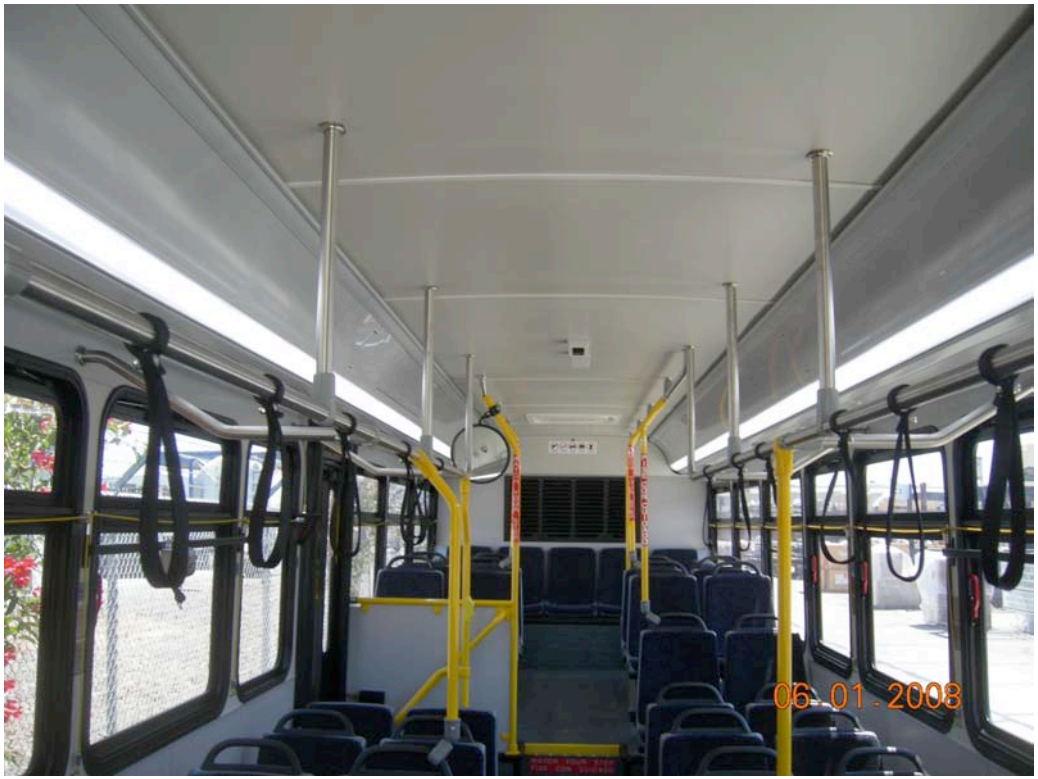
- 300mm modules
- 8 or 16 Watts module 480 / 720 lumens
- Simple installation and connection
- Remote driver AC/DC – up to 8 modules
- Or Integral driver 12- 24 VDC
- Range optical beam patterns
- Warm (3000k), Neutral (4200k), Cool (5500k)

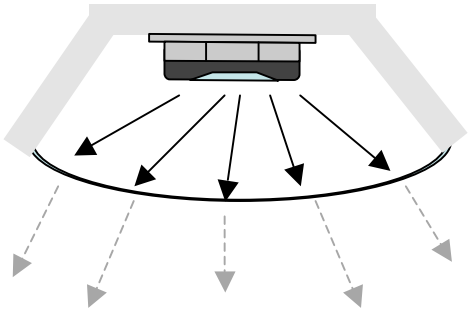
Direct linear illumination

Section view of typical direct linear lighting fixture



Direct linear lighting using LEDs





Section view of linear lighting fixture designed around Powerwhite module with low glare optics

150 lux achieved with dual row @ 30 watts per meter

Retrofit Case Study

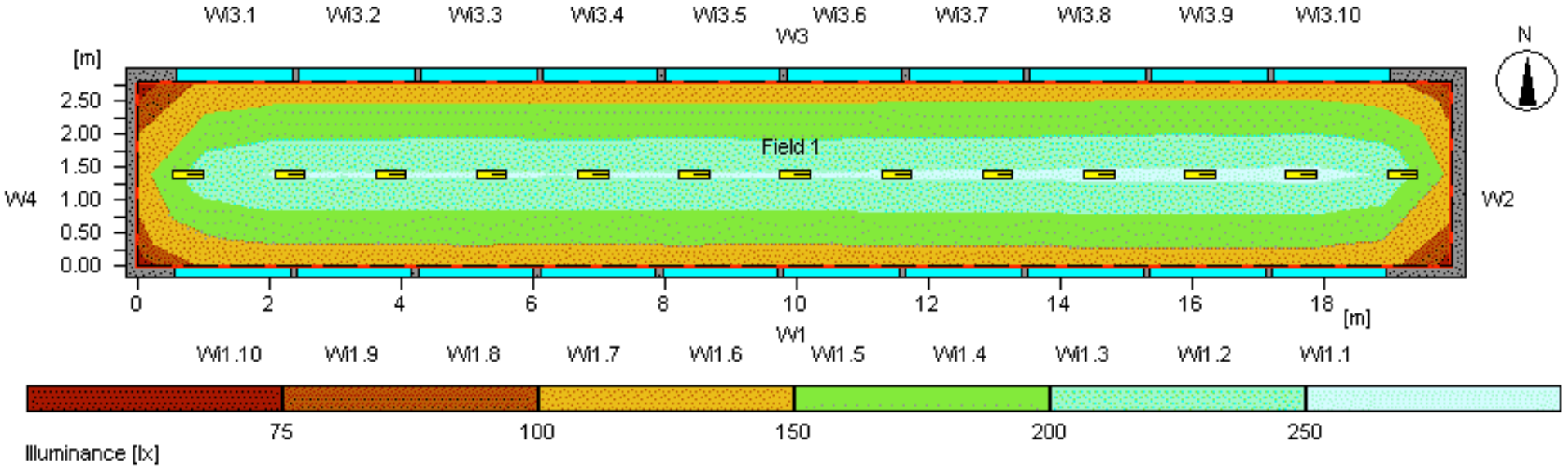
Current Installation – Quad T8 Tubes

2000 Watts of Lighting per carriage

Total Lumen output – 160,000 Lumens

Lighting requirement – 150lux, 1:4 uniformity

Simulation with LEDs



Illuminance

Average illuminance	Eav	156 lx
Minimum illuminance	Emin	60 lx
Maximum illuminance	Emax	263 lx
Uniformity g1	Emin/Em	1:2.61 (0.38)
Uniformity g2	Emin/Emax	1:4.41 (0.23)

LED Option

- Simulation data

  150lux , with 500 Watts LEDs

  40,000 Lumens

- Number of converters reduced from 52 down to 4

Summary

- LEDs can outperform Fluorescent technology in many linear lighting schemes.
- A whole system understanding is required to maximise benefits of LED technology
- Newer modules simplify the design, specification and maintenance of LED based lighting

- Any Questions ?