



Optics Development for LED Street Lighting

OEC AG



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OEC AG



- Founded 1999 by Prof. Dr. Harald Ries
- Mission: professional and usable realization of the scientific research results of Prof. Ries.
- Public Company since 2002
- Independent, no external influences by banks or shareholders
- Exclusive Dealer of ORA's *LightTools*® and CODE V®
 - High end optics design software
- Highest concentration of illumination optics experts as an independent service provider



LED streetlighting



- Many enquiries to OEC for LED-street lighting systems development
 - Germany, Dubai, USA ...
- Dense media coverage and public discussion
 - Google hits for LED street lighting: 2.6 Mio, 10K in German
- Technical change and regulation
 - 3 Mio streetlamps in Germany to be exchanged
 - Mercury banned from 2010



Why LEDs ?



- What is the competition for LED-street-lamps
- What are the advantages of LEDs in street lighting



Metal Halide vs. LED



	Mercury	Metal Halide	LED
Power	50-1000 W	20-250 W	1-5 W
Efficiency	50 lm/W	110 lm/W	80 lm/W
Price/ klm	illegal	7€	10-20 €
Lifetime	illegal	22000 h	50000 h

- No strong case for LEDs based on competitive analysis of lamp types



Advantages of LEDs for Street Lighting

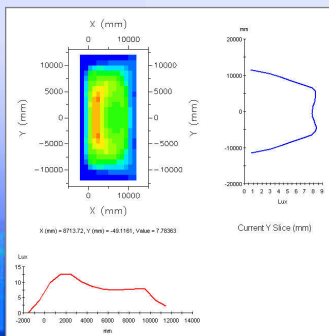
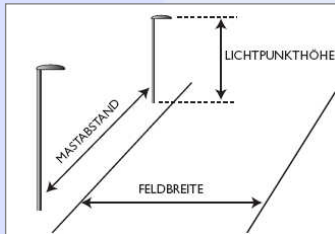


- Colour selection
- Colour control
- Efficient and functional dimming
- LEDs are small -> Modular Systems with many LEDs
 - Different styling
 - No complete failure -> lamp module lifetime longer than LED lifetime!
 - Adaptation to different lighting situations
- LEDs allow for dedicated optics
 - No light pollution
 - High system efficiency



Tailored LED System

OPTICS & ENERGY
CONCEPTS



- 20 m by 10 m from 6m post
- 10 lx average 5 lx min (u_0 0.5)
- 2000 lm at target
- With 2400 lm from LEDs
 - 30W electrical power
- 80% efficiency LED to target
- Leading Metal Halide Product:
 - 70W electrical Power
 - 40% efficiency Lamp to target



Tailoring Optics

OPTICS & ENERGY
CONCEPTS



- Optical design methods
 - For mirrors
 - For lenses
- Perfect for LED-Optics
- Every ray is controlled to the target
- Yields the prescribed light distribution
- Based on the physical laws of illumination optics

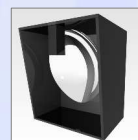
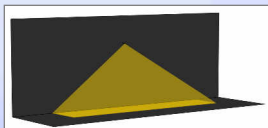
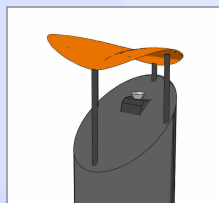


Tailored LED-Optics

OPTICS & ENERGY
CONCEPTS



- Sidewalk luminaire
- Emergency lighting
- Colour control wall washer
- Outdoor lighting



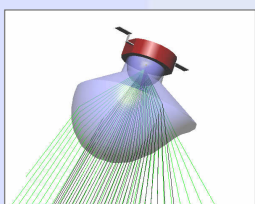
See also: www.led-professional.com

Tailored Optics Contribution to Product Design

OPTICS & ENERGY
CONCEPTS



- Small efficient optics
- Straight forward development
- Dedicated for prescribed function
- High efficiency
 - Lower number of LEDs required
 - Lower energy consumption
 - Lower heat load
 - Extremely reduced stray light
 - No light pollution no light smog



Conclusion



- Street lighting is a good application for LEDs
- Main competition is state of the art Metal Halide
- Product development needs to play key strengths of LEDs
- Development needs team of Experts
- Optics development plays key role for mature products

