LED Lighting Technology Benefits and Challenges

**Benefits**

- Energy efficient – compact size & less heat dissipation compared to incumbents
- Long lasting – electroluminescence at low input power
- Solid-state properties – robust, low-power operation
- Electronic controls – intelligence, remote operation, integration

**Challenges**

- caused by same physical reasons – solid-state devices
- light distribution (LID) – ill-suited for illumination high luminance, flat emitters
- heat dissipation – must be managed heat-sinks add challenges for LID, cost
Lighting Statistics & Future Solutions

Figure 11-1. Total worldwide light consumption in different sectors by lamp type in 2005. (IEA 2006)

LED luminaire replacements for LFL and Edison bulbs?

LFL Usage out of total Light consumption:
57% per person

LFL Usage out of total commercial application:
57%

Commercial Application:
Light consumption = 44%
Energy consumption = 40%

Global lighting
Improving Light Distributions in LED Luminaires

US Patent 8,348,467 issued to M. Nisa Khan on January 8, 2013
Solutions Demand Optoelectronic Engineering & Manufacturing

Thermal (Design, Simulation, & Measurement)

Optical (Design, Simulation, & Measurement)
Comprehensive Background, Challenges, Theory, and Solutions for LED Luminaire Engineering & Manufacturing

in the Forthcoming Book

Understanding LED Illumination

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