

Real Lighting with Solid State Lamps (SSL) aka LED

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The Promise of SSL

- Energy efficient
- Ultra-long life
- Small size
- Versatility
- Broad range of temperature
- Dimmable
- Any color desired

Most Current Installations

- Color changing
- Patterns of light
- Often designed to interact with diffusing material



Well-known problems of SSL

- Not especially efficient outside of the lab
- White light is hard to create
- White color quality not too good
- Temperature issues affect life and output
- Uneven depreciation of different color LED's
- Expensive when good
- Not so good when inexpensive
- Very small bang very big buck

Limitations of Early SSL Products

- Color changing is comparatively easy
- White light, not so easy
- Limited light output
- Extremely high \$\$\$ per lumen
- No more efficient than incandescent lighting

Recent Progress

- Practical understanding of temperature issues
- Ability to achieve 50 lumens per watt with warm toned white light
- Ability to achieve CRI>80 using blended LED
- Preliminary standardization of electrical characteristics

Breakthrough Product 2007

- The Cree Downlight
- 600+ lumens
- 12 watts
- Dimmable
- 2700K
- >90 CRI
- Use in almost any standard 6" downlight including IC-AT



LED Lighting 2008

- Evolving practical products
 - White light
 - Color
 - Color changing
- Products with useful amount of light
- Light distribution methods offering many new options

Principal Directions

- LED Components
- LED Bulbs
- LED Projectors
- LED Engines
- LED Fixtures
- LED Special Products
- LED Systems

LED Components

- Simple basic building blocks
- Made by LED makers/electronics companies
- Used by fixture companies



LED Bulbs

- Fit into incandescent sockets
- Pretend to be incandescent lamps
- Primary Issue: incandescent lamps don't need heat sinks
- A retrofit approach with limited possibilities



LED Projectors

- PAR and MR lamp styles
- Watt limited by heat sink issue
- Applicability concerns, such as overheating problems in AT-IC downlights



LED Engines

- Lumen package based
- Integral heat sink
- Form factor suitable for conventional or new luminaires
- Hemispherical radiator
- Blended white light



The LED Engine

- Lumen package concept
- Works for downlights and projectors
- Sizes
 - 600 lumen (12 w) = 75 watt R lamp
 - 1200 lumen (24 w) = 26 watt CFL fixture
 - 2000 lumen (40 w) = 42 watt CFL fixture

LED Fixtures

- The lamp is the fixture
- Replace fixture not lamp



LED Fixtures

- Best when the fixture can be a good heat sink, too



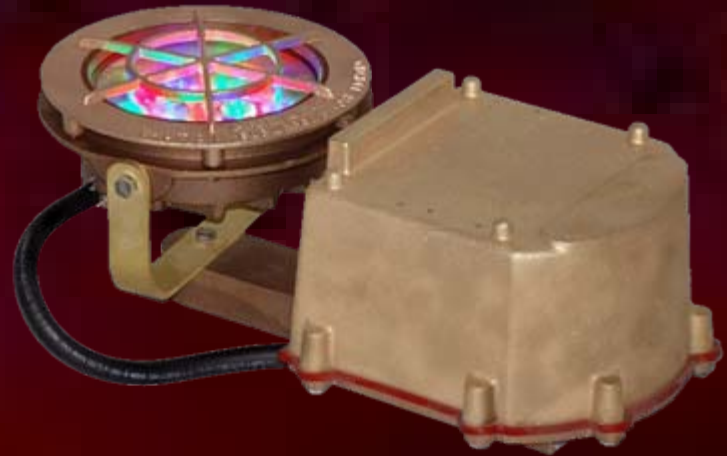
LED Special Products

- Lighting for pools and water features (Water keeps LED's cool)



LED Special Products

- Lighting for pools and water features



LED Special Products

- Lighting for refrigerators (another “cool” spot)



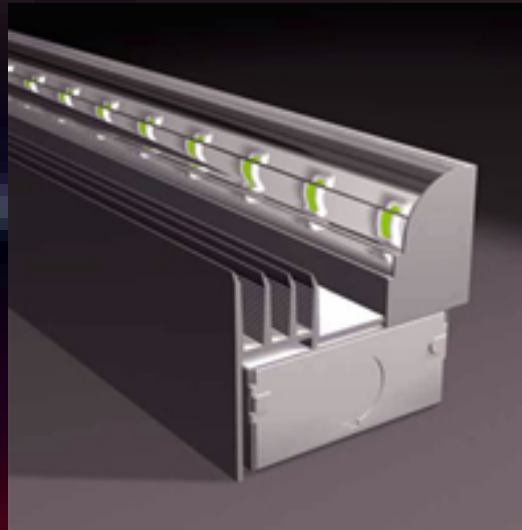
LED Special Products

- Special fixtures for optimum applications



LED Systems

- Flexible systems with broad applicability



LED at Light + Building 2008



LED cove lighting system

LED at Light + Building 2008



LED ring pendant and recessed

LED at Light + Building 2008



LED rings and downlights

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LED color systems

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LED/T5 hybrid

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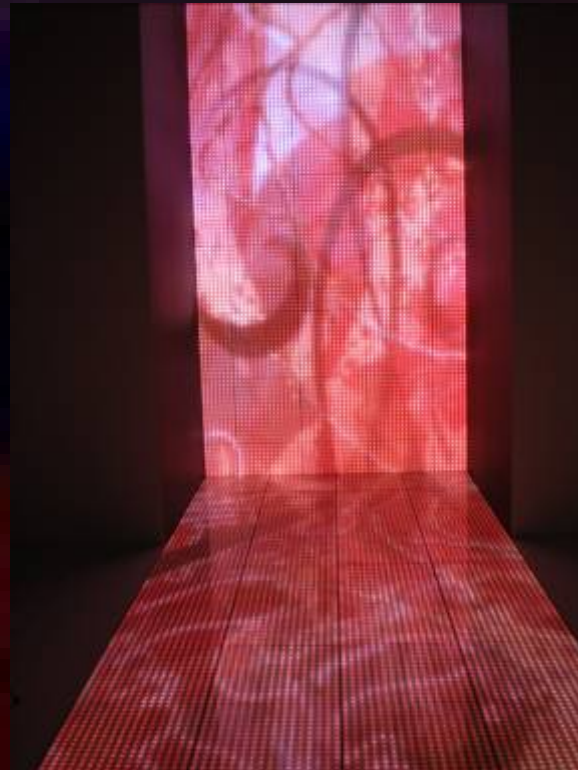
LED Decorative

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LED/ hybrid decorative

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LED Video Floors and Walls

LED at Light + Building 2008



LED linear

LED at Light + Building 2008



LED pendant

LED at Light + Building 2008



LED Pole Light

Assessment

- Are LED's practical?
- Are LED's cost effective?
- Are LED's efficient?
- Are LED's ready to play a major role?

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System efficiency for better products is now as high as compact fluorescent or some HID.

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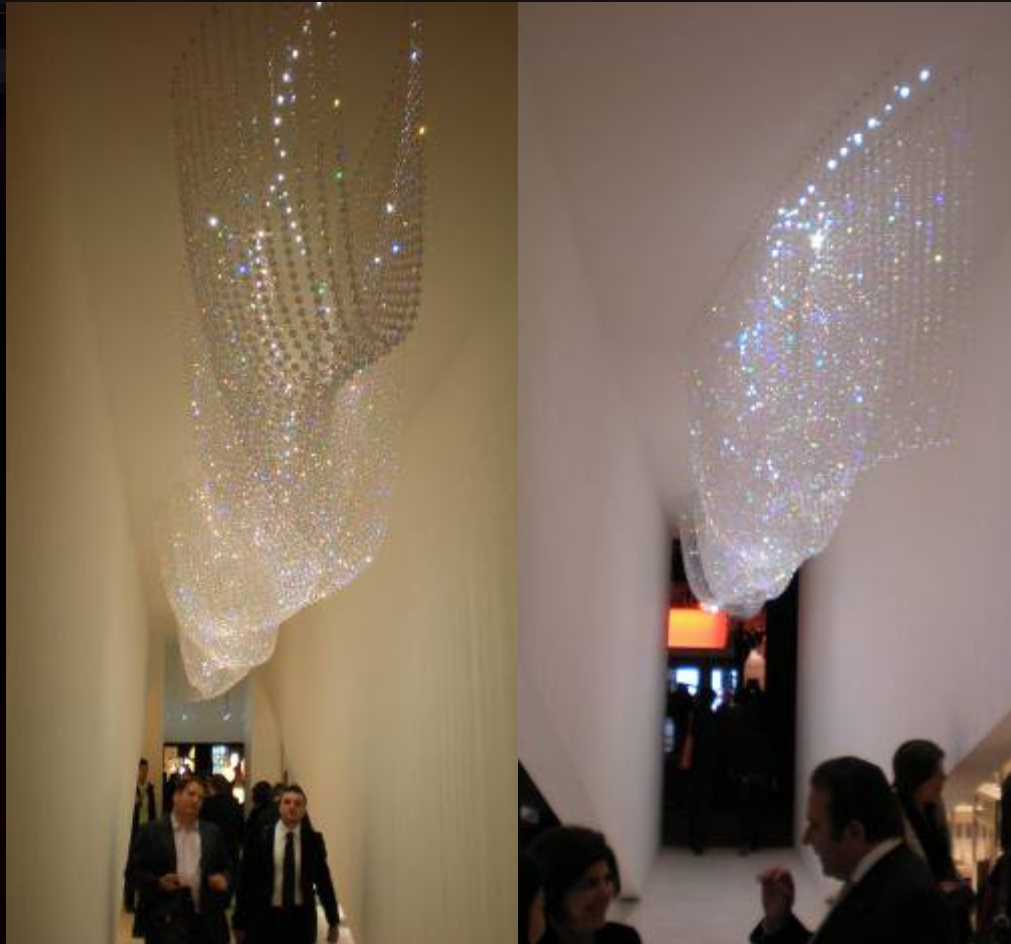
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System efficiency for better products ...

- Are LED's ready to play a major role?

Yes, in applications where cost is acceptable.

Really Beautiful LED



Real Lighting with Solid State Lamps

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