Lighting and Controls Market Update

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In our lifetimes we have seen a number of technology evolutions:

- Automobiles

1908

2016

- Telephones

1890

2016

- Computers

1943

2016

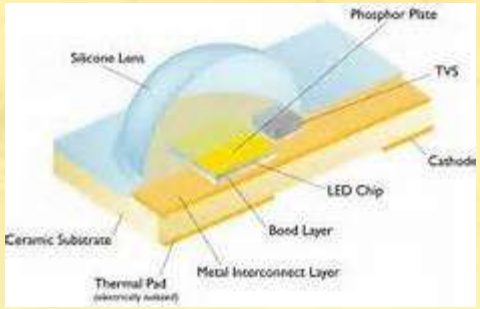
And also lighting……

- **Incandescent** - Developed in 1879, produces about 15 lumens per watt and lasts up to 2500 hours

- **Fluorescent** - Perfected in the 1950's, produces today as much 70-90 lumens per watt and normally lasts about 20-40,000 hours

- **High Intensity Discharge** – Developed in early 1900's, but perfected in the 1960's. Produces about 60-100 lumens per watt, and last up to 30,000 hours

- **LED** - First invented in 1970, but only red, white LED's developed in 2000. Now over 120 lumens per watts and lasts 50-100,000 hours.

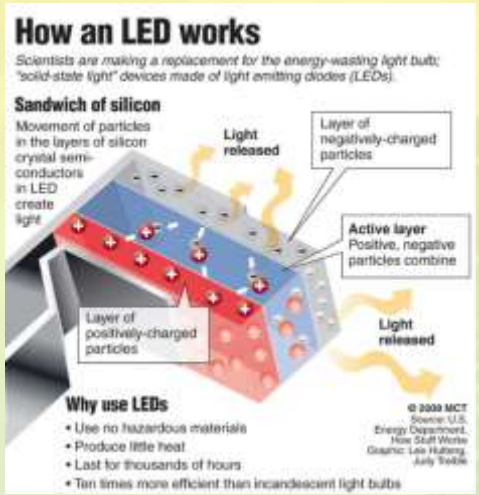


What is a LED light source?

- Light Emitting Diode – a computer chip

- A combination of a variety of technologies:
  - Semiconductors
  - Optics
  - Phosphor chemistry

- The best characteristics of all other lamp sources:
  - Instant on, dimmable and small like incandescent
  - Efficient, long lasting and durable like fluorescent
  - Long life and bright like HID, likes the cold



So Why Convert to LED ?

- Saves Money, the most efficient light source available
- Available to replace almost any light source or fixture
- Great color and color options
- Super long life – probably never replace in your lifetime
- Sustainable – no hazardous materials
- Controllable - incredible options to operate

What are the best interior LED applications?

Medium Base Screw ins - Just about every possible incandescent and CFL screw in lamps have cost effective LED replacements.

Recessed Cans - Probably one of the most mature LED product categories. Very cost effective and a range of choices in size and design.

Exit Signs **-** A no brainer, been around for years. Inexpensive and a great payback.

What are the new interior products becoming popular?

LED fluorescent lamps - In an effort to LED right now many people are installing lamps that look just like fluorescents. They are low cost and last longer than most existing lamps, many are dimmable.

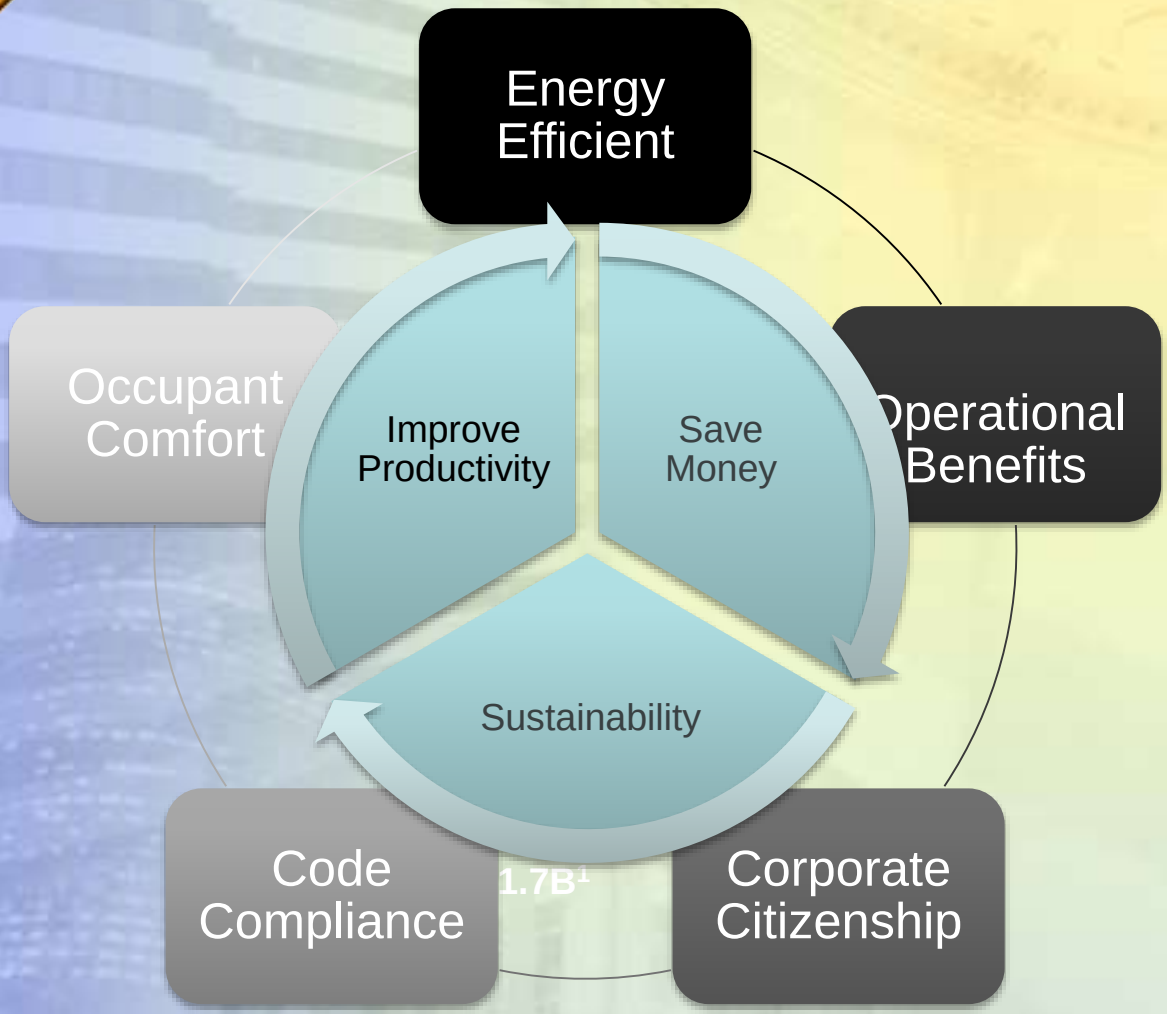
LED CFL replacements - CFL's are efficient but have a relatively short life, these plug in replacements are an easy retrofit.

Fluorescent Fixtures and Retrofit kits – This is the holy grail. There are hundreds of millions of existing 2x4 and 2x2 ceiling fluorescents that are well suited for upgrade to LED.

What is the next big trend for Interior LED?

- Imbedded Controls
- Factory installed sensors, daylight controls and wireless nodes for communication.
- Adds savings and reduce costs
- Biggest barrier to implementation is costs, huge savings over manual control installation and wired technology
- Data is the gold of today's world. Fixtures can now be data mining sites.

The Connected Building

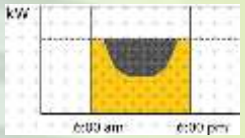


Solid state, Digital, Wireless

Change the way you look at the Light Fixture...

Energy Management Solutions

Occupancy



Task Tuning

Enterprise Level Control

Daylight Harvesting

Full Bldg Integration

Get The Load Down

Demand Response

HVAC

Time Scheduling

Plug Load

Non-Lighting Loads

Simple. Smart. Scalable.

Simple: Single box solution with intuitive, complete software user interface.

Smart: Turning dumb devices intelligent and bringing connectivity to the building to meet the goals of organization.

Scalable: Expand system at the rate your organizations needs. Lighting, HVAC, Plug Load, Mechanical – to scale you to E-IoT

What are the advantages of exterior LED lighting?

- Lower energy cost
  - LED more efficient than traditional exterior sources
  - LED is very effective at dimming
- Lower maintenance cost
  - Longer life means less frequent replacement
  - Important if maintenance requires special equipment
- LED light is a point source and can be directed
  - Distributes light more uniformly where light is needed
  - Decreases light pollution and light trespass
- Improved light quality and color choices
  - Higher CRI (color rendering index) means truer colors
- Increased safety and security
  - LED provides “instant on”, no cycling at end of life

Pictures tell the story…

Before

After

What are the best exterior LED applications?

Area Lighting - Mature LED product category. Very cost effective and a range of choices in size and designs.

Parking Garages - May operate 24x7, wide variety of new fixtures and retrofit options, can also be controlled.

Streetlights **-** If you own your streetlights, new LED fixtures offer significant energy and maintenance cost savings.

Other Exterior Uses of LED

Why control exterior lighting?

Extend Product Life

Incentives

Save Energy

Demand Response

Energy Code
Compliance

Asset Management

Security

Control Strategies for Exterior Lighting

- Input – trigger
  - Photocontrol
  - Occupancy Sensing
  - Scheduling
- Output - action
  - Switching - ON-OFF
  - Dimming
    - Continuous
    - Multi-level

Control Strategies for Area Lighting

- Turn lights ON at dusk, OFF at dawn or preset time
- DIM or OFF at preset time, when normal activity ceases
- RAISE light to full based on occupancy
- DIM back down, if no further activity

- Some lights can stay on all night at full output for security
- Over-ride for special events

Control Strategies for Parking Garages

- If not open 24/7, turn lights OFF after hours (exception, security lights)
- If open 24/7, DIM lights in unoccupied zones by at least 30%, RAISE lights to full based on occupancy
- DIM back down, if no further activity

- If perimeter areas are daylit, DIM electric lights so combined illumination is appropriate
- Light entrance/exit zones as prescribed to enable eyes to transition to day/night conditions

What is the next big trend for Exterior LED?

- Networked Controls – fixtures can now collect and transmit a wealth of information!
- Field or factory installed photocells and occupancy sensors with wired or wireless nodes for communication.
- Centrally monitor individual fixture performance
- Improve maintenance service efficiency
- Remotely control individual or groups of fixtures to maximize energy savings – turn on, turn off, dim, flash, change color, etc
- Enhance public safety, reduce liability

How to Manage Risk

- Manufacturer Warranties
- Company History
  - Longevity and Financial Strength
  - Recall Programs
- 3rd Party Verification
  - Industry competitions
    - *Lighting For Tomorrow* (ALA, CEE, UL)
    - *Next Generation Luminaires* (DOE, IES, IALD)
  - DLC (Design Lights Consortium) Qualified Products List
  - Energy Star labeled products

Lighting Upgrades Can Be Included in Performance Contracts

- Select an ESCO partner
- Investment Grade Audit
  - Inventory existing lighting
    - Determine hours of operation and energy cost
  - Design new energy efficient lighting and controls
  - Calculate savings, cost, payback
    - Energy savings
    - Operational savings (maintenance, HVAC, etc)
- Complete Construction & Commissioning
- Measure & Verify the Savings!

Questions???

Thank You!

Atlantic Energy Concepts

Your success is our commitment.

SYLVANIA LIGHTING SOLUTIONS

Please visit our websites

www.AtlanticEnergyConcepts.com

www.lightingsolutions.osram.com/northamerica