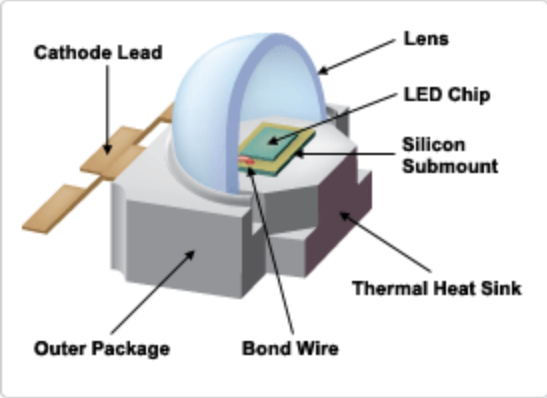
LED Applications

Presented for:

Waste Reduction Partners



Presented by:
Thomas D. Mull, PE, PEM, CEM
Carolina Consulting Group, Inc.

LED Applications

Interior Applications – New & Retrofit

LED Applications

Interior Applications – New & Retrofit

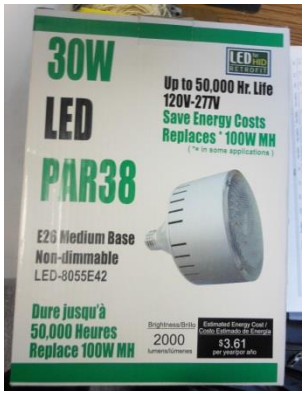
- *LED Benefits*
- *Fundamental Considerations*
- *Fixture/Lamp Offerings*
- *Factors impacting the decision to replace or retrofit*
- *Economic Considerations*
- *Case Studies*
- *Certifications*

LED Applications

Be Cautious When Selecting

The U.S. has been on the forefront of LED development in efficacy, color, and control.

However, there are offerings that may not provide all of the flexibility ***(dimming, light harvesting, etc.)*** ***typically inherent to better LEDs.***



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Be Cautious When Selecting

So, customer should make sure that their lamps/fixtures have all of the features that they require.

Also, check on manufacturer's warrantees, servicing capabilities (after the sale), and ask for specific references related to your selection.

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LED Benefits

- *Energy and environmental savings*
- *Up to 150 lumens per watt*
- *Longer rated life (50,000 hours)*
- *Reduced maintenance expenditures*
- *Control Flexibility (dimming, daylight harvesting, etc.)*
- *Improved quality of light*
  - *Notably clearer sharper – excellent contrast*
  - *Better color rendition (CRI 90+)*
- *Quiet (As compared to older fluorescent systems)*

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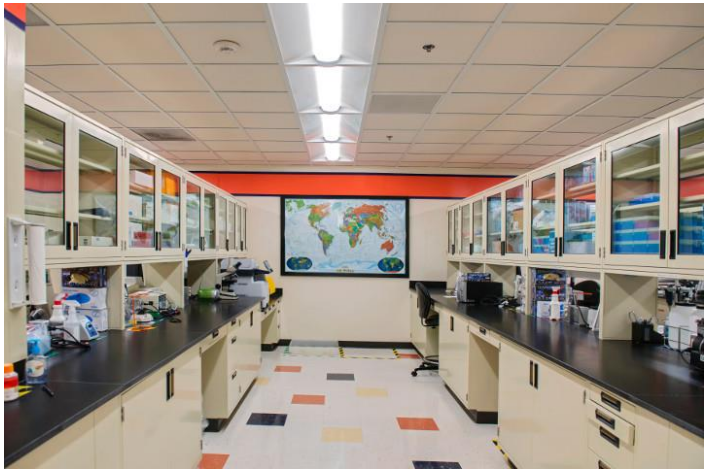
LED Benefits

Fluorescent



LED

Improved contrast and color

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Fundamental Considerations

- ***Approximately 30% of the energy used in commercial facilities has historically been for illumination. The adoption of LED fixtures and lamps has the potential to reduction lighting energy by 50% or more.***

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Fundamental Considerations

- *LED technology is changing rapidly. In new installations and retrofit applications LEDs are increasingly replacing less efficient sources, both indoor and outdoor.*
- *LEDs are offering increased control flexibility (dimming, daylight harvesting, etc.).*
- *LED fixture and lamp offerings are increasing with a wider array of selections.*

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Fundamental Considerations

- *With increased acceptance, luminaire/lamp prices are coming down.*
- *Some utilities have partnered with home improvement stores* for selected (mostly A-type lamps) LED replacement lamp incentives.*
- *LED fixtures/lamps are becoming mandatory to reach increasing strict energy efficiency and color standards.*

* This may be only in selected areas.

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Fixture/Lamp Offerings

The variety and availability of LED fixtures and lamps is ever increasing. There are replacement lamps and fixtures for most existing interior applications.

Viable replacement lamps for incandescent lamps, compact fluorescents and linear fluorescents are readily available.

LED BR30 lamp

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Fixture/Lamp Offerings

It should be noted that lamp/fixture pricing is highly sensitive to the quantity purchases.

Following is a sampling of more popular LED lamps and fixtures currently available.

Category: Replacement lamps:

A-Type

Recessed fixture replacement LED

BR30

LED Applications

Fixture/Lamp Offerings

Category: Replacement lamps:

MR16 Lamps

PAR30

Linear fluorescent replacement LEDs

PAR38

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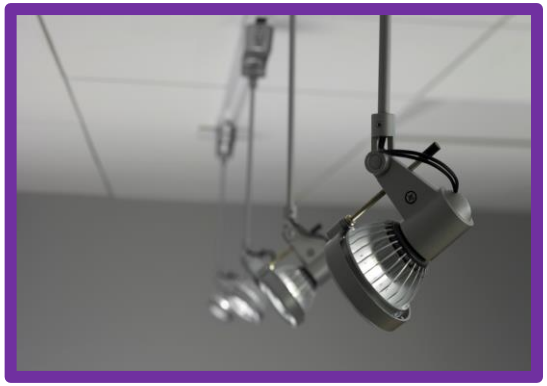
Fixture/Lamp Offerings

Category: Replacement lamps:



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Fixture/Lamp Offerings

Category: Replacement lamps:

CFL Replacement

MH Lamp Replacements

Biaxial Fluorescent Replacement LEDs

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Fixture/Lamp Offerings

Category: Recessed Can-Type Fixtures:

Courtesy of CREE

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Fixture/Lamp Offerings

***Category*: Recessed Can-Type Fixtures:**

These fixtures come in a variety of configurations and wattages, typically 4 or 6 inches in diameter. Unit pricing is generally from $20 to $100+.

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Fixture/Lamp Offerings

Category: Recessed Can-Type Fixtures:

LED Applications

Fixture/Lamp Offerings

Category: Recessed Can-Type Fixtures:

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Fixture/Lamp Offerings

Category: Fluorescent Troffer-Type Fixtures:

CREE LED Troffer Installations

LED Applications

Fixture/Lamp Offerings

Category: Fluorescent Troffer-Type Fixtures:

2x4

1x4

2x2

Troffer-type fixtures typically come in three (3) configurations. List pricing varies significantly, with a median price being about $150 for 2x2 and $170 for 2x4 fixtures.

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Fixture/Lamp Offerings

Category: Fluorescent Troffer-Type Fixtures:

GE 2x4 – 49W

Columbia 2x4 – 52W

CREE 2x2 U-tube Replacement – 35W

GE 2x2 – 37W

Lithonia 2x4 2-lamp – 43 W

CREE 2x2 – 35 W

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Fixture/Lamp Offerings

Category: Fluorescent Strip-Type Fixtures:

CREE CS (Low Bay)

T8

LED

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Fixture/Lamp Offerings

Category: Fluorescent Troffer-Type Fixtures:

In addition to replacement troffers there are retrofit kits available.

CREE UR Series Retrofit Kit ($100 for 4' fixture)

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Fixture/Lamp Offerings

Category: Fixtures for HID Applications:

LED Applications

Fixture/Lamp Offerings

Category: Fixtures for HID Applications:

CREE CXB Series

Bridgelux LED

LED Applications

Fixture/Lamp Offerings

Category: Fixtures for HID Applications:

LED Applications

Replace or Retrofit

The question of whether economics favor replacement or retrofitting a lighting system can depending upon the following factors:

- *Condition of the existing fixtures*
- *Cost of electricity*
- *System maintenance costs*
- *Desired type of fixture control*

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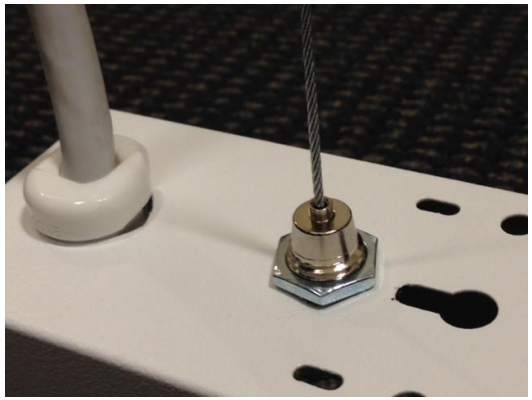
Replace or Retrofit

- *Existing circuitry*
- *Availability of appropriate options*
- *Other consideration (mounting, etc.)*



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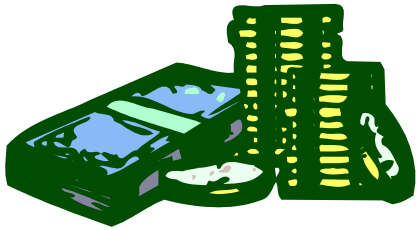
Economic Considerations

Simple Payback, ROI
or
Life Cycle Costing



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Economic Considerations

The three (3) fundamental methods for evaluating energy projects or initiatives have been Simple Payback, Rate of Return and Life Cycle Costing (LLC).

The latter (LLC) takes into consideration the total cost of ownership of a system or asset and is, therefore, the most appropriate measure of economic worth. However, most lighting projects are still evaluated based upon their Simple Payback.

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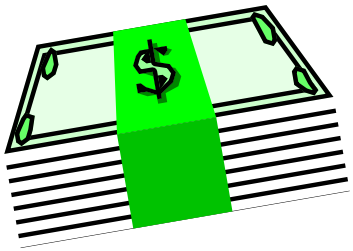
Economic Considerations

The reason for this is understandable. Most decision makers understand Simple Payback. Those that also understand the other methods, know that if a project meets a specific Simple Payback, the overall economic benefit should be better.



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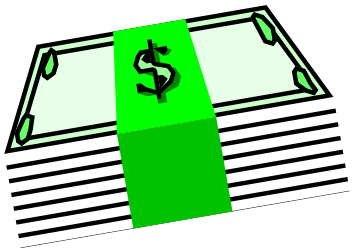
Economic Considerations

Historically, Simple Payback of 2 to 3 years have been the norm in the commercial/ industrial sectors. But that has been changing. Today, paybacks of 3 to 5 years are becoming more widely accepted.



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Economic Considerations

So, what type of facilities are more likely to accept longer paybacks and, consequently, be better candidates for LEDs?

- ***Governmental buildings*** ***(local, state and federal)***
- ***K-12 Schools***
- ***Colleges & Universities***
- ***Hospitals, Clinics, Doctor's Offices***
- ***Institutional***
- ***Grocery stores***
- ***Manufacturing operations***
- ***Office buildings, etc.***

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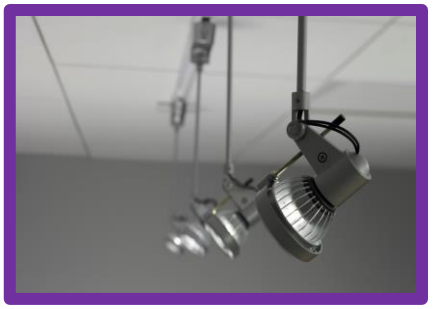
Economic Considerations

Cost-effective end use applications include:

- ***Generally illumination***
- ***Supplemental/decorative lighting***
- ***Signage (exit signs and decorative)***
- ***Elevators***
- ***Refrigeration cases***
- ***Warehouses/distribution centers***
- ***Others***



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Economic Considerations

Economic factors impacting acceptance of LEDs:

- ***Annual operating hours***
- ***Cost of electricity***
- ***System maintenance costs***
- ***Incentives/rebates***

Remember, don't overlook the non-economic factors!

LED Applications

Economic Considerations

Economic factors impacting acceptance of LEDs:

- ***Annual operating hours***
  The great the number of annual operating hours the more cost-effective LEDs become.
- ***Cost of electricity***
  The higher the cost of demand and energy, the quicker the payback. Therefore, similar customers served by a municipality or REMC will typically show a faster payback.

LED Applications

Economic Considerations

Economic factors impacting acceptance of LEDs:

- ***System maintenance costs***
  If the existing system has become a maintenance issue, then LED's will provide additional savings.
- ***Incentives***
  Incentives in the form of manufacturer's or utility rebates can be critical in a customer's decision

LED Applications

Case Studies

Following is a series of case studies involving new/retrofitting with LED fixtures. The economics of each project is proprietary. However, they have been noted as having a simple payback in the range of 3 to 5 years.

CREE KR Series Fixtures

LED Applications

Case Studies

***Case Study 1*: Raleigh Orthopedic Clinic**

***Status*: New**

***Description*: A 98,000 sf orthopedic clinic and surgical center located in Raleigh, NC.**

***Major Factors in Selecting LEDs*:**

- ***Quality of light***
- ***Overall affordability***

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Case Studies

Case Study 1: Raleigh Orthopedic Clinic

CR24 – 2x4

CR22 – 2x2

Fixtures installed: CREE CR22 and CR24 troffers

LED Applications

Case Studies

***Case Study 2*: South Winn Insurance Services Calmar, Iowa**

***Status*: New**

***Description*: Office suite**

***Major Factors in Selecting LEDs*:**

- ***Loose the hum and the flicker***
- ***Higher quality of light***
- ***Brighter "greener" system***

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Case Studies

Case Study 2: South Winn Insurance Services

LE6 Downlight

CR24 – 2x4

Fixtures installed: CREE CR24 troffers and LE6 downlights

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Case Studies

***Case Study 3*: Watson Clinic – Lakeland, FL**

***Status*: Renovation**

***Description*: Healthcare facility**

***Major Factors in Selecting LEDs*:**

- **Reduced operating cost while improving patient services**
- **High luminosity and color rendering**
- **Daylight harvesting capability**

LED Applications

Case Studies

Case Study 3: Watson Clinic – Lakeland, FL

CR24 – 2x4

CR22 – 2x2

LR6 Downlight

Fixtures installed: CREE CR22 and CR24 troffers and LR6 downlights

LED Applications

Case Studies

***Case Study 4*: Westcor Land Title Insurance Maitland, FL**

***Status*: Renovation**

***Description*: Headquarters Office**

***Major Factors in Selecting LEDs*:**

- ***Reduced operating and maintenance costs***
- ***Quality of light***
- ***No ballast hum***

LED Applications

Case Studies

Case Study 4: Westcor Land Title Insurance Maitland, FL

KR4 Downlight

CR22 – 2x2

Fixtures installed: CREE CR22 troffers and KR4 downlights

LED Applications

Case Studies

Case Study 5: Discount Variety Retailer

Status: Renovation

Replaced T12 & T8 fluorescent fixtures along with metal halide fixtures.

Within one year saved:

- *$4,457 in energy (70% reduction),*
- *$2,760 in maintenance,*
- *CO_2 emission savings estimated at 65,342 lbm*

Before *After*

LED Applications

Certifications

As with every developing technology, there is going to be a number of offerings available. Not all will meet customer expectations and perform as rated.

To aid customers in selecting products that have been shown to meet accepted performance standards there are two (2) certifications, either of which should assure good performance.

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Certifications

DLC and Energy Star provide qualified product listings. To meet their program criteria, utilities offering incentives for lighting will typically require that lamps/fixtures be "certified" by DLC or Energy Star.

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energy ENERGY STAR

LED Applications

Summary

LED lamps and fixtures are rapidly becoming the most cost-effective approach to illuminating commercial (and industrial) facilities. Whether new or retrofit, they offer a variety of options than can meet most any customer needs.



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Thanks,

Dan

LED Applications

Resources:

A special thanks for the following companies that contributed to this presentation.

- ***CREE***
- ***LiteSource***
- ***Lithonia***
- ***Columbia***
- ***Sylvania***
- ***GE***
- ***Others***