

Lighting Retrofit Opportunities



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Glossary of lighting terms

- Lumen-international unit of luminous flux(quantity of light)
- Lumens per watt- (efficacy) measure of efficiency of a light source(ie.-100watt incandescent lamp produces 1750 lumens = 17.5 lumens per watt)
- Color Rendering Index- (CRI) a system used to rate a lamps ability to render colors based on a scale of 0-100
- Ballast Factor- powering a lamp with a “referenced ballast” to provide an expected light output
- Instant Start- most electronic ballasts- consume less energy - parallel wired
- Rapid Start- magnetic ballasts- withstand higher switching cycles - series wired

H.I.D. Lighting

High Intensity Discharge

- Types of H.I.D. lighting:
 - High Pressure Sodium
 - Mercury Vapor
 - Low Pressure Sodium
 - Metal Halide
 - Pulse-Start Metal Halide
- Characteristics of H.I.D. lighting
 - Most efficient(Lumens per watt)
 - Lowest rendering(quality) 25-65CRI out of 100
 - High lumen depreciation after first 6 months
 - Slow start up
 - very limited control (dimming motion, etc.)

Applications for H.I.D. Lighting



- Street lighting
- Security Lighting
- Sports Lighting
- Warehouse Lighting
- Retail Lighting

Energy Saving options to H.I.D 400 watt Metal Halide example

- 360watt Metal Halide lamp - no electrical changes
- saves 10% electricity- cost around \$30.00-
maintains same light output as 400 watt
- 320 watt Pulse Start Metal Halide- must change
fixture- saves 20% electricity- cost around
\$140.00 plus labor
- T-8 fluorescent High-Bay fixture- must change
fixture - saves 50% electricity- cost around
\$180.00 plus labor

320 watt Pulse Start features

- Starts in lower temperatures with quicker starting time than standard 400W MH
- 20% savings
- Maintains 85% of lumens throughout its life(compared to 60% with standard MH)
- Catastrophic failure threat (1200 deg F)
- Limited control (dimming / motion,etc)
- PRPA/Fort Collins rebate \$64.35

T8 Fluorescent High Bay

Features

- 50% Electricity Savings
- Instant start & restrike
- No Catastrophic failure threat
- Maintains 95% lumens over lamp life
- No fixture noise
- High Color Rendering 74-85(out of 100)
- Dimming & motion switching possible
- 32degree starting temperature(some zero)
- PRPA/Ft Collins rebate \$126.50

Sample comparison savings HID vs. T8 retrofit


- 400 watt Metal Halide
- 465 watts w/ ballast
- Operating 16 hours/ day 5 days/week (4160 hrs.)
electricity cost is **\$116/**
fixture/year
(at \$0.06/kWh)
- 6 lamp T8 Fluor. High bay
- 224 watts
- Electricity cost - **\$55/** fixture/yr
- material & installation cost
around \$275.00
- **\$132.00 rebates** = \$143 net
- **Payback = 2.6 years**
- Other savings could reduce
payback to less than 2 years

Best opportunities for retrofit



- Warehouse
- Retail
- Production Areas/ Manufacturing
- Local Example - Sam's Club

Thin is In !!!!!



Retrofitting Four Foot
Fluorescent Fixtures to
T8 Lamps / Electronic Ballasts

Differences between Magnetic and Electronic Technology



- Wattage input
- Light output
- Applications
- other differences

Wattage input

- Magnetic input wattage constant 36 watts per lamp (energy saving ballast)
- Electronic ballast wattage varies with type of ballast:
 - low ballast factor - 24 watts per lamp
 - normal ballast factor - 29 watts per lamp
 - high ballast factor- 35 watts per lamp

Light output

- T12 magnetic lamp - 2200 - 2600 lumens
- T8 lamp combined with ballast factors:
 - low ballast factor = 2260 lumens
 - normal ballast factor = 2900 lumens
 - high ballast factor = 3335 lumens

Other differences

- Frequency -
 - 60 Hz magnetic
 - 25,000 Hz electronic
 - reduces flicker
 - eliminates ballast noise
- operating temperature - 60% cooler than electronic
- ballast warranty - 5 years electronic/ 3 years magnetic
- Lamp life same - 20,000 - 24000 hours

Applications

- Low ballast factor- same # of lamps, same light output, 30% energy savings
- Normal ballast factor - 95% of light output, de-lamp from 3 to 2 lamps, 51% energy savings
- High ballast factor, 90% light output, de-lamp from 4 lamps to 2 lamps, 49% energy savings

Other Savings



- Air Conditioning
- Maintenance

Savings Illustration

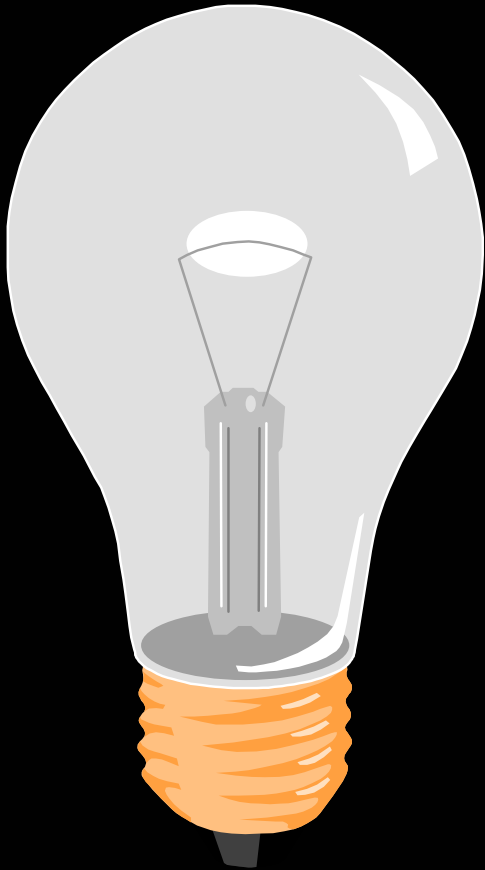
- 2 lamp 4' T12 magnetic
- 12 hours/ day
- \$0.06 / KWH
- **Operating cost / year =**
\$14.70 + material cost +
labor+ A/C cost = avg.
\$18.00

- 2 lamp 4' T8 Electronic
- **Operating cost / year =**
\$9.80
- **Retrofit cost**
 - Materials \$18.50
 - Labor \$15.00
 - Total \$33.50
 - **Rebate: \$12.00**
 - Net cost : \$21.50
 - **Payback 2.6 years**

Summary of benefits

- 30 - 60% energy savings
- 2.6 years or less payback
- better lighting environment
 - less flicker
 - Higher quality
 - no ballast hum
- No maintenance for 3-5 years
- lower operating temperature
- flexible ballast configurations
 - low/normal /high ballast factor
 - 1 ballast operates 1-4 lamps

Compact Fluorescent Lamps



- The Best Idea?

Why use compact fluorescent lamps?



- 75 -90% energy savings
- Long life (6000 - 20000 hours)
- Cost per lamp is decreasing with increased popularity
- Operate cooler than incandescent lamps
- Several types & sizes now available
- Fastest Return on Investment

Drawbacks to using compact fluorescent lamps

- Dimming is not controlled easily
- Starting temperature not suited for outdoors (at full light output)
- Light not directed easily (cannot spot)
- Aesthetics - no replacement for candle style lamp and other incandescents
- Initial cost more than incandescent

Best places to use Compact fluorescent lamps

- Non- dimming fixtures
- Indoors
- High Ceilings
- Places operating more than 4 hours per day
- Fixtures where lamps aren't exposed (lamp shades, sconces, recessed cans)

Energy comparison

- 60w lamp costs \$.34 to purchase, has a 1000 hour life, operating 12 hours a day for 5 days per week costs approximately \$14.00 to operate for 1 year
- 15w lamp costs \$6.50 to purchase, has an 8000 hour life and costs \$3.00 to operate for 1 year and is eligible for a \$3.60 rebate
- Net savings is \$8.10 per year per lamp!!

L.E.D. Technology
(light emitting diode)



Photoluminescent
technology

Characteristics of LED's

- Operates at low temperature
- Use over 90% less energy than incandescent product 75% less than fluorescent
- Available in red, green, clear, gold colors
- increasing number of applications
- long life 50,000 - 250,000 hours

Most common applications



- Traffic signals
- Exit signs
- Vehicle tail lights
- indicator lights on equipment (computers, calculators, stereos, etc.)

LED exit signs

- Exit signs- operate 8760 hours per year
- LED exit signs warranty 5 years to lifetime
- Battery warranty 5 years
- expected LED life is 25 years(250,000hrs)
- available in green or red with or with emergency light combo
- material cost between \$30.00 & \$250.00

LED vs. Incandescent Exit cost

- **Incandescent**

- Uses 30-40 watts electricity(\$15.50-16.00/year)
- lamps change twice per year @ \$4.00 per exit + labor
- battery life - 3-5 years
- add heat to building and housing yellows
- **5 year cost = \$140**

- **LED**

- Uses 2-3 watts electricity(\$1.40-\$1.60/yr)
- LED life 25years/ battery life-5yrs
- Initial installation cost: \$32.00 /sign w/battery \$30.00/ installation \$21.80/ PRPA rebate \$40.20 net cost
- **5 year operating cost =\$48**

What - No Electricity?

Photoluminescent Exits Signs

- Glow in the dark
- Use no electricity
- Meets NFPA regulations
- requires no license to install - single or double face ceiling or wall mount
- cost around \$120.00/ single face sign
- Best application when no electricity available

Questions and Comments



Thank-you for your time!