LED Lighting

Advantages
LEDs have several advantages over other light sources:
• energy efficient
• long life
• potential to save money
• no mercury
• unique applications

Economic
Compare lighting options based on the cost of ownership and the payback period (how long it will take to recoup the investment of new lighting). The payback period is sensitive to how long the lighting is used each day.

\[
\text{Cost of ownership} = \text{up-front cost of new lighting} + \text{cost of labor to install the lighting} + \text{cost of electricity over the life of the installation} + \text{cost of bulb replacements over the life of the installation}
\]

\[
\text{Simple payback period} = \frac{\text{cost of new lighting}}{\text{electricity cost savings from new lighting} + \text{bulb replacement cost savings from new lighting}}
\]

Efficacy

Advantages
LEDs have several advantages over other light sources:
• energy efficient
• long life
• potential to save money
• no mercury
• unique applications

Economics
Compare lighting options based on the cost of ownership and the payback period (how long it will take to recoup the investment of new lighting). The payback period is sensitive to how long the lighting is used each day.

\[
\text{Cost of ownership} = \text{up-front cost of new lighting} + \text{cost of labor to install the lighting} + \text{cost of electricity over the life of the installation} + \text{cost of bulb replacements over the life of the installation}
\]

\[
\text{Simple payback period} = \frac{\text{cost of new lighting}}{\text{electricity cost savings from new lighting} + \text{bulb replacement cost savings from new lighting}}
\]

LEDs are quickly gaining acceptance in residential, commercial, and industrial settings.
LED Lighting

Challenges

Consider these challenges when purchasing and installing LEDs:
- higher up front cost
- dimmer compatibility
- difficult to predict how long they’ll last
- thermal management

Thermal Management

LEDs are sensitive to heat. For every increase of 10° C in its chip temperature, an LED’s life can be cut in half.

- Avoid installing LED lamps totalling more than 17 W in one enclosed fixture.
- Avoid blocking ambient air circulation from fins or other parts used for heat dissipation.
- Avoid installing LEDs in hot areas, such as over stoves and ovens.

Dimmer Compatibility

Various LED products can perform differently on one dimmer, and one LED product can perform differently on various dimmers.

Check product dimmer compatibility tables and test out equipment combination if possible.

Product Selection

Some tips:
- Refer to qualified product lists, such as ENERGY STAR® and the DesignLights Consortium.
- When replacing an existing lamp or fixture, make sure the LED product produces at least as much light, measured in lumens, as the one it is replacing.
- Check that the color temperature matches.
- Check that the lamp will physically fit into its housing.
- LED products need to carry the same certifications as other fixtures, such as for wet locations and insulated ceilings.
- Check dimmer compatibility.
- For commercial and industrial buildings, make sure the fixture meets the utility’s power factor requirements.
- Check for a strong warranty.

This document summarizes the information from an interactive web video of the same name, which can be found at www.lrc.rpi.edu/programs/lightingTransformation/index.asp

Lighting Research Center