1.8 LED LIGHTING

LEDs (Light Emitting Diodes) are solid light bulbs which are extremely energy efficient. When first developed, LEDs were limited to single-bulb use in applications such as instrument panels, electronics, pen lights and, more recently, strings of indoor and outdoor Christmas lights. Manufacturers have expanded the application of LEDs by "clustering" the small bulbs. The first clustered bulbs were used for battery powered items such as flashlights and headlamps. Today, LED bulbs are made using as many as 180 bulbs per cluster, and encased in diffuser lenses which spread the light in wider beams. Now available with standard bases which fit common household light fixtures, LEDs are the next generation in home lighting. A significant feature of LEDs is that the light is directional, as opposed to incandescent bulbs which spread the light more spherically. This is an advantage with recessed lighting or under-cabinet lighting, but it is a disadvantage for table lamps. New LED bulb designs address the directional limitation by using diffuser lenses and reflectors to disperse the light more like an incandescent bulb. The high cost of producing LEDs has been a roadblock to widespread use. However, researchers at Purdue University have developed a process for using inexpensive silicon wafers to replace the expensive sapphire-based technology. This promises to bring LEDs into competitive pricing with CFLs and incandescents. LEDs may soon become the standard for most lighting needs. We are following these developments with interest and will report the latest updates in this research.

Benefits of LED lightbulbs

Long-lasting - LED bulbs last up to 10 times as long as compact fluorescents, and far longer than typical incandescents.

Durable - since LEDs do no t have a filament , t hey ar e not damaged under circumstances when a regular incandescent bulb would be broken. Because they are solid, LED bulbs hold up well to jarring and bumping.

Cool - these bulbs do not cause heat build-up; LEDs produce 3.4 btu's/hour, compared to 85 for incandescent bulbs. Common incandescent bulbs get hot and contribute to heat build-up in a room. LEDs prevent this heat build-up, thereby helping to reduce air conditioning costs in the home.

Mercury-free - no mercury is used in the manufacturing of LEDs.

More efficient - LED light bulbs use only 2-17 watts of electricity ($1/3^{rd}$ to $1/30^{th}$ of Incandescent or CFL). LED bulbs used in fixtures inside the home save electricity, remain cool and save money on replacement costs since LED bulbs last so long. Small LED flashlight bulbs will extend battery life 10 to 15 times longer than with incandescent bulbs.

Cost-effective - although LEDs are initially expensive, the cost is recouped over time and in battery savings. LED bulb use was first adopted commercially, where maintenance and replacement costs are expensive. But the cost of new LED bulbs has gone down considerably in the last few years. and are continuing to go down. Today, there are many new LED light bulbs for use in the home, and the cost is becoming less of an issue. To see a cost comparison between the different types of energy-saving light bulbs, see our Light Bulb Comparison Charts.

Light for remote areas and portable generators - because of the low power requirement for LEDs, using solar panels becomes more practical and less expensive than running an electric line or using a generator for lighting in remote or off-grid areas. LED light bulbs are also ideal for use with small portable generators which homeowners use for backup power in emergencies.

Choosing an LED lightbulb

Many different models and styles of LED bulbs are emerging in today's marketplace. When choosing a bulb, keep in mind the following:

 Estimate desired brightness - read the package to choose desired brightness level. You can use wattage to compare bulb illumination, for example, a 9W LED is equivalent in output to a 45W incandescent. However, the new method for comparing bulbs is lumens. Lumens is the measure of perceived brightness, and the higher the lumens, the brighter the bulb. The FTC has mandated that all light bulb packages display lumens as the primary measure for comparing bulbs. For more information about lumens, see LED Terminology further down this page.

 Do you need a 3-Way bulb? - new LED bulbs are available as combination 3-Way bulbs. These replace 30, 60 and 75-watt incandescent bulbs, while consuming 80% less power than an incandescent bulb! TheSwitch 3-Way LED is also omnidirectional, so it can be used anywhere you would use an incandescent.

 Choose between warm and cool light - new LED bulbs are available in ‘cool’ white light, which is ideal for task lighting, and ‘warm’ light commonly used for accent or small area lighting.

 Standard base or pin base - LEDs are available in several types of ‘pin’ sockets or the standard “screw’ (Edison) bases for recessed or track lighting.

 Choose between standard and dimmable bulbs - some LED bulbs, such as the Switch, LED novation and FEIT LED bulbs, are now available as dimmable bulbs. They will work on your standard dimmer switch.

 Choose high quality bulbs or they will die prematurely - do not buy cheap bulbs from eBay or discounters. They are inexpensive because the bulbs use a low quality chip which fails easily.

 Look for certifications - including FCC, Energy Star and UL.

The common styles of LED bulbs include the following:

1. Diffused bulbs

In this style LED bulb, clusters of LEDs are covered by a dimpled lens which spreads the light out over a wider area. Available in standard Edison bases, these bulbs have many uses, such as area lighting for rooms, porches, reading lamps, accent lamps, hallways and low-light applications where lights remain on for extended periods.

2. Dimmable Globe LED bulbs

Designed for bathroom vanities or anywhere a globe bulb is required, these bulbs produce light equivalent to a 40-watt incandescent bulb, yet only consume 10 watts of power. Dimmable from 100% to 10%, these bulbs have a 200-degree beam angle to cast light in a wide area.

3. Track Lighting, pin base

Available in MR-16 (pin base), LEDs are ideal for track lighting. LEDs do not contribute to heat buildup in a room because no matter how long they remain on, they do not get hot to the touch. Also, because they are 90% more efficient than incandescent, and last 10 times longer than CFLs, the frequency of changing bulbs is greatly reduced.

4. Flood Reflector LEDs for Recessed Cans and Track lights, screw-in base

LEDs are now available for standard recessed lighting pots and housings. They range from 7.5 to 17watts, with beam widths from PAR20 to PAR38. Several models are

dimmable. Also, because they are 90% more efficient than incandescent and last 10 times longer than CFLs, the frequency of changing bulbs is greatly reduced.

5. Flame Tip, Candelabra Base LEDs

Designed to replace incandescent candelabra bulbs, these flame tip LEDs deliver the equivalent light of 25 - 35 watt incandescent while only drawing 3.5 watts of electricity. Because of the heat sink in the base, light doesn't disperse downwards as much as a typical incandescent candelabra bulb.

6. LED Tube Lights

Designed to replace fluorescent tube bulbs, these LED tubes are available in 8 and 16 watts, which replace traditional 25-watt and 40-watt T8/T10/T12 fluorescent tubes. Because fluorescent lights are often installed in high ceilings in commercial sites, there are additional savings because the frequency of changing bulbs is greatly reduced.