SASKATCHEWAN ENERGY MANAGEMENT TASK FORCES

TECHNOLOGY INFORMATION SHEET

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COMPACT FLUORESCENT LAMPS

1. Background

Compact fluorescent lamps (CFLs) are the most significant lighting advance developed for homes in recent years. They combine the efficiency of fluorescent lighting with the convenience and popularity of incandescent fixtures. CFLs can replace incandescents that are roughly 3 to 4 times their wattage, saving up to 75% of the initial lighting energy. Although CFLs cost from 10 to 20 times more than comparable incandescent bulbs, they last 10 to 15 times as long. This energy savings and superior longevity make the investment worthwhile.

When introduced in the early- to mid-1980s, CFLs were bulky, heavy, and too big for many incandescent fixtures. However, newer models with lighter electronic ballasts are only slightly larger than the incandescent lamps they replace.

CFLs come in integral and modular designs. Integral CFLs have a ballast and a lamp in a single disposable unit. Modular designs feature a separate ballast that serves about five lamp replacements before it wears out.

Because of the advances in tube design and ballast technology, today's compact fluorescent lamps also have good colour characteristics (CRI > 80), have high power factors (> 90%), last 10,000 hours, and cause low harmonic distortion.

2. Screw Based CFLs

Screw based CFLs are designed to replace incandescent globe and parabolic reflector (PAR) lamps. The design of this lamp has therefore sought to emulate the size and shape of incandescent lamps. Triple tube or spiral tube lamps, some enclosed in a glass globe, with wattages between 9 and 25 watts are designed as substitute for the conventional 40 - 100 watt incandescent lamps. PAR lamps rated at 20 - 25 watts replace 75 and 100 watt incandescent floods.

Most new screw type CFLs use integral electronic ballasts in the base of the lamp. They last about 10,000 hrs, have an efficacy of 60-70 lumens per watt compared to 15-18 lumens per watt and 1000 hrs for most incandescents. Colour quality is good at a CRI of 80+.

Care must be taken in replacing incandescents in certain fixtures because the geometry of the lamp is different. This is

particularly true in PAR lamps where the reflector is designed for a point source of light. The fixture efficiency (the fraction of the light produced by the lamp that actually gets out of the fixture) will be reduced. This effect is minimized by the short profile shape of newer screw mounted CFLs.

3. Pin Mounted CFLs

Pin Type CFLs have 2 or four pin connections on the lamp which fit into a base connected to conventional preheat rapid start electromagnetic or electronic ballasts, or a ballast located in the base. Several lamps can be run off one ballast. Only the lamp needs to be replaced when it burns out but not the ballast. Separate lamps are made for each ballast type. Lamps for electronic ballasts are dimmable (when used with a dimming ballast).

Pin type CFLs tube configuration is either a two or four tube design, and are produced in sizes up to 42 watt - equivalent to a 150 watt incandescent lamp.

Pin type CFLs are mostly designed to be used in dedicated fixtures designed for the CFL lamp shape. (See below)

4. Dedicated CFL Fixtures

Future usage of CFLs will mostly be in dedicated fixtures using pin-type lamps. This will not only improve the fixture efficiency of CFLs in different applications, but also prevent users from going back to incandescent lamps when the CFL lamp burns out. Dedicated fixtures for pin-type CFLs currently on the market include table and desk lamps, and PAR flood and spot lamps. These fixtures have reflectors and lenses specifically matched to the design, shape, and type of light provided by a CFL.

5. Positioning of CFL Lamps

CFL lamps used to have to be positioned pointing downward to be effective, losing up to 20% in efficacy in the upright position. Newer lamps do not have this restriction.

6. The Effect of Temperature

A fixture, which does not allow adequate lamp ventilation, will run too hot and cause the lamp to lose efficiency. While CFLs have higher efficacy than incandescents, they still produce heat. Newer CFLs minimize this temperature effect, however, and dedicated CFL fixtures allow proper ventilation.

CFLs, like most fluorescent lamps also lose efficacy and light output at low temperatures. Most are therefore not suitable for outside use. Globe type CFLs, which use a domed cylindrical glass, cover for the compact tube can be used outside. Several manufacturers supply lamps that retain a high output down to -20 deg. C.

7. Power Quality

Early CFLs had notoriously low power factors. This is no longer a problem. All integral ballast screw mounted CFLs now contain power factor correction, and if pin-type lamps are used with modern high power
ballasts, their power factors are also high.

Harmonic distortion is also low in today's CFLs.