

LIGHTS IN THE BARN

Arguably, one of the biggest changes we have seen in energy consumption is the type of light bulbs we use. In 2015, the Canadian government banned the import and sales of incandescent light bulbs, in favor of more energy efficiency compact fluorescent lights (CFLs). If your barn still has some incandescent lights kicking around, now is the time to swap them out. Even though it might seem wasteful to replace perfectly good existing bulbs, the savings in electrical costs for most bulbs will make up the difference in a matter of months. Besides CFLs, fluorescent tube systems have been a main source of light for barns where ceiling height is less than 12', and the more energy efficient high intensity discharge (HID) fixtures (including metal halide and high-pressure sodium) for barns with a ceiling height exceeding 12'. However, there is a new kid on the block, light emitting diode (LED) lights. Using LED lights reduces electrical consumption by 75-80% compared to incandescent bulbs and 50-60% over spiral CFLs. They are also more energy efficient than fluorescent tube and HID lights. While LED lights are more expensive to purchase compared to other light fixtures, in most situations the savings in electricity costs (with LED lights) provide a return on investment in one to two years.

LED lights are becoming very popular not only due to their high-energy efficiency, but also thanks to their long life and low maintenance cost. The expected life of LED bulbs is 50,000 to 100,000 hours, as opposed to 24,000 hours for fluorescent and HID lamps.



Energy efficient light bulbs. Left - compact fluorescent lights (CFLs); Right - light emitting diode (LED).

Another key benefit of LED lighting is the ability to dim the lights, allowing for the provision of dawn and dusk periods, much like natural sunrise and sunset. Providing a transition from light to dark periods can reduce stress caused by sudden changes in light, through reduction of feed competition when the lights are switched on in the morning. Lastly, LED lights can provide different colour spectra. Pigs have low sensitivity to red lights; in other words, they perceive red lighting as darkness, resulting in the possibility to provide a red 'service' light that allows workers to come into the facility after hours without disturbing or interrupting the sleep cycles of the pigs. Controllers can automatically control light intensity, colour spectrum and photoperiod length. You can even get fancy and connect the lighting system to Wi-Fi, so you can collect data and control lights from your phone or laptop.

LED lights come in a variety of shapes: tiles, tube units, fluorescent tube replacement LEDs (which fit the original fittings, often with the need to remove ballast devices or make other alterations), battens, flexible strips and globelike designs. Many LED lights come with an Edison fitting, so they can be screwed directly into existing light fixtures. All LED lighting systems operate using direct current (DC) with either a centralized AC-to-DC rectifier, or each lamp containing a rectifier within its body and electronics. Many LED lights designed for use in agriculture have heat sinks to remove heat from the semiconductors. In pig barns, it is important to ensure these sinks remain clear of contamination and you clean them between batches so that they operate efficiently - while taking care not to force water into light housings.



LED light dimmers



Make sure you provide a minimum lighting level of 50 lux, which is enough for a person to read a newspaper, for a minimum of eight hours a day to all pigs. Also provide at least six consecutive hours of darkness (<5 lux) per day. Table 2 displays the recommended light levels and photoperiods for different ages of pigs.

Other cost savings tips:

- To reduce energy use, consider using timers, programmed to turn lights on/off to meet daily swine needs.
- Another way to save some money on energy use is by installing motion sensors in personnel areas so lights are only on when people are around, like washrooms and storage areas.

LED LIGHTING

- Choose lights with a colour temperature between 2,700 (living room light) and 5,000 (bright outdoor light) Kelvin.
- Go with lights that have a color-rendering index (CRI) of 80-100.
- Go with bulbs that are sealed and easy to clean. Do not choose bulbs with a built-in fan because they plug up fast in a barn setting.
- Choose a bulb with an enclosure that has protection against dust and water -shown through an Ingress Protection (IP) rating on the bulb.
 - Go for a minimum IP65 or IP66 rating. The first number stands for dust protection, with 6 being the highest rating, and the second number stands for water protection, with 9 being the highest rating.
- Go with a brand that provides 5-to-10-year warranty. Make sure to keep the receipt and write down the date on the bulbs. This way, if there is a recall, or several bulbs burn out before the warranty period ends, you can get a new box of bulbs from the manufacturer.
- Light fixtures should be CSA and UL approved.
- Get a quality product with the ENERGY STAR or DesignLights Consortium logo on it.

Table 2. Recommended light levels and photoperiods for pig barns.

Type of barn	Light levels	Photoperiod (h/d)	Comments
Breeding/gilts	>10 f.c. (>100 lux)	14-16	Necessary for estrus cycling
Gestation	>5 f.c. (>50 lux)	14-16	To assist missed cycles, bring estrus on again
Farrowing	5-10 f.c. (50-100 lux)	8	If no heat lamps, some light in room 24 h/d
Nursery	5 f.c. (50 lux)	8	Some light in room 24 h/d
Grower-Finisher	5 f.c. (50 lux)	8	

What's the cost?

Let's consider the cost of electricity for a 60-watt incandescent light bulb. Assuming the lights are on 8 hours per day for 30 days per month, the light bulb will use 14.4 kWh per month. At a price of \$0.15/kWh, the electricity for this incandescent light bulb costs **\$2.16** per month. If we replace the 60-watt incandescent bulb with an equivalent CFL bulb that uses 13 watts, the cost will go down to **\$0.47** per month. To replace the bulb with an equivalent LED bulb that uses 9 watts, the cost would go down even further to **\$0.32** per month.

Now let's consider replacing a 34-watt T-12 fluorescent tube light with a 16-watt T-8 equivalent LED tube light. Again, assuming the lights are on 8 hours per day and electricity costs \$0.15/kWh, the T-12 fluorescent tube light would cost **\$1.22** per month vs. **\$0.58** per month for the LED tube light.

Before taking the plunge to switch to LED lights, do keep in mind that some electrical upgrades may be needed to accommodate the switch.