

COLD CATHODE LIGHTING FOR BROILER HOUSES

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With today's relatively high light-level requirements in poultry houses and with lights on for longer periods, the old Edison style incandescent lamps are only about 5% efficient at converting energy to light. The rest is wasted as heat energy. Incandescent lights also attract flies and other insects, and are quickly coated with dirt that further reduces the amount of light available. One energy-saving recommendation, therefore, is to **change from incandescent lights to cold cathode**. Replacing incandescent bulbs with dimmable cold cathode bulbs can save 8,000 to 12,000 kilowatt hours/house/year, with a payback period of a few months to 2 years depending on the farm.

Figure 1. Incandescent light bulb in a broiler house



Photograph by Doug Overults

Figure 2. Cold-cathode bulb in a broiler house



Photograph by Doug Overults

Anyone who has used a laptop computer has benefited from cold-cathode fluorescent lighting since this technology is used to provide the back-lights of computer. In conventional Compact Fluorescent Lights (CFLs) a hot cathode made of tungsten wire coated with barium carbonate emits electrons which pass through mercury vapor and generate ultraviolet light. It doesn't take much energy to release these electrons, but the lamp takes a minute or two to reach full brightness. By contrast, with a cold-cathode lamp it takes a much greater voltage drop—and hence more energy—to release the electrons in the unheated cathode.

The biggest **advantage** of cold cathode lighting is that they can be dimmed with most light dimmers, including those currently used to dim incandescent light bulbs. The lights are capable of a full range of dimming from 100% to near zero. Cold cathode lights also start at low temperatures; can be cycled on and off without significant bulb life reduction; and are flicker free when dimmed.

The **output** of cold cathode lighting, measured as lumens per watt, is a little less than compact fluorescent lights. For example, an 8-watt cold cathode light has a rated initial lumen output of about 40 lumens per watt. A 10-watt compact fluorescent light pro-

vides about 52 lumens per watt. Incandescent bulbs produce only 12-15 lumens per watt. The **expected life** of cold cathode bulbs is over two times that of a compact fluorescent bulb. An 8-watt cold cathode bulb has a rated life of 18,000 hours, whereas the rated life of a 10-watt compact fluorescent bulb is 8,000 hours.

One **disadvantage** at the present time is that cold cathode bulbs with a screw-in base that fits standard light fixtures are only available in 5-watt and 8-watt sizes. A simple replacement of incandescent lights with cold cathode bulbs may not supply sufficient light intensity for brooding young chicks. One solution is to install an additional lighting circuit in the brood half of the barn. On this new circuit, compact fluorescent lighting can be installed in between the cold cathode lights and turned off when no longer needed. In poultry houses that only have lights over the feed lines, an additional row of cold cathode bulbs could be installed in the center of the house.

An 8-watt cold cathode bulb costs about \$10, approximately four times the cost of compact fluorescent bulbs. As already indicated, cold cathode bulbs do have a longer life expectancy, but the initial cost is still substantially higher at the present time. **Cold cathode bulbs are most cost effective when replacing incandescent lights.** The energy savings from replacing compact fluorescent lighting to cold cathode light is not sufficient to offset the initial set up costs.

Here are the answers to some frequently asked questions:

- Q. *With small size bulbs, how do I get a higher light level at the beginning of my flock?*
- A. One solution is to install an additional lighting circuit in the brood half of the barn. On this new circuit, CFLs can be installed in between the cold cathode lights and turned off when no longer needed. In barns that only have lights over the feed lines, an additional row of cold cathode bulbs could be installed in the center of the barn.
- Q. *Should I replace my CFLs with cold cathode bulbs?*
- A. Making that change would not produce any energy savings to help offset the cost. Cold cathodes are much more cost effective when replacing incandescent lights.
- Q. *How should I dispose of used cold-cathode light bulbs?*
- A. It is **very important to recycle any type of compact fluorescent bulbs**, including the cold cathodes, since they contain small amounts of mercury. If breathed and absorbed by the body, mercury can cause neurological damage. A compact fluorescent light bulb contains an average of 5 mg of mercury – about one-fifth the amount of mercury in an average watch battery, and one-hundredth the amount of mercury in an amalgam dental filling. No mercury is released when CFLs are intact or in use.

It is against the law to dispose of any items containing mercury in the regular solid waste trash. Compact fluorescent light bulbs must be disposed of in the same way as paint, batteries, thermostats, and other hazardous items. The Kentucky Division of Waste Management provides an online list of solid waste coordinators in Kentucky (<http://www.waste.ky.gov/>). For questions, call 502-564-6716.

- Q. *I've heard that light color impacts poultry. What colors are emitted from cold-cathode lights?*
- A. Light is of particular importance for breeder flocks. Chickens need light to stimulate egg production. Light is described by its wavelength, which determines which color you see. Red light has a long wavelength and penetrates the skin and skull of a chicken and stimulates chickens to lay eggs. Compact fluorescent bulbs work well for chickens and are better than incandescent bulbs since they have a balanced light with lots of red. CFLs radiate a different light spectrum from that of incandescent lamps. The chemical composition of the phosphor (the chemical compound that lines the inside of CFL bulbs) determines the color temperature of the light emitted by the bulb. When excited, it converts ultraviolet radiation into visible light. Improved phosphor formulations have improved the subjective color of the light emitted by CFLs such that the best 'soft white' CFLs available in 2007 are subjectively similar in color to standard incandescent lamps.