Using LED Lights Can Reduce Your Electric Costs

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Electricity used for lighting a poultry house is a significant cost associated with raising chickens that varies according to the lighting program used. Growers have used an array of different lighting programs and equipment. Compact fluorescent bulbs that have a longer life and use less power compared to incandescent bulbs became popular for a time. As low intensity light programs were initiated, growers switched back to incandescent bulbs because most fluorescent bulbs are not dimmable.

An alternative to using typical incandescent and fluorescent bulbs for poultry house lighting are the relatively new LED lights. LED is short for light emitting diode. Groups of LEDs have been used in devices such as traffic lights, automobile brake and turn lights, digital watches and other applications where low energy consumption and long light life are important. Once you recognize the appearance of an LED light bulb, you’ll notice them frequently in everyday use.

How Do LEDs Bulbs Work?
Some of you might be curious how LED bulbs operate. Notice in the picture (next page) the green surface that is the actual light emitting diode. A diode is a simple semi-conductor material that is aluminum – gallium – arsenide for LEDs. A semi-conductor is a material that has a changing ability to conduct electric current. As voltage is applied across a diode, electrons on the diode materials begin to move and photons are released. Photons are small packets of energy that form light. By properly designing the diode materials, a certain frequency of photons are released that result in light that is visible to a human eye. LEDs are engineered to release a large number of photons to generate the required quantity of light. LEDs are placed in plastic bulbs that concentrate generated light in a given direction, usually through the rounded end of the bulb. The higher cost of an LED bulb compared to an incandescent bulb is primarily involved with the cost of the semi-conductor material that comprises the diode.

A typical LED bulb is comprised of several individual LEDs.
LED Bulbs Consume Less Electric
LEDs use far less electricity than typical incandescent bulbs. An LED bulb that is equivalent to a 25 to 35 watt incandescent bulb uses about 0.7 watts! Similarly, an LED lamp that is approximately equivalent to a 75 to 100 watt incandescent bulb uses approximately 2 watts. How can an LED bulb use so much less electricity than typical bulbs? Incandescent bulbs use a filament that must be heated to produce light. They generate a lot of heat using electricity that is not used to produce light. LED bulbs don’t have filaments that require heat, so they don’t use as much electricity.

LED Bulbs Have a Long Life
Incandescent filaments burn out in relatively short duration and limit bulb life. While a common incandescent bulb has a life from 750 to 2000 hours, a LED bulb has an average life of 100,000 hours (over 11 years of continuous use!). A longer life means growers will spend less time climbing ladders changing light bulbs that have burned out.

Other Advantages of LED Bulbs
LED bulbs have other advantages in addition to the low energy consumption and their longer life mentioned above. LED bulbs are smaller than other bulbs. They are protected by a hard plastic shell (bulb). These traits make them less susceptible to damage by forklifts when a flock is moved. In addition, LED bulbs are dimmable with typical lighting hardware and are available in different colors (wavelengths) of light.

So … What’s the Downside to LEDs?
If something is too good to be true, it probably is, right? The obvious downside to LED bulbs is their cost; however, there is even good news related to cost. LED bulbs cost between $12 and $18 each. The cost is higher than other bulb types because LEDs use an advanced semiconductor material to generate light. As is the case with many of today’s new technological products, the price of LED bulbs is coming down as more are used. Remember, LED bulbs have a much longer life than typical incandescent bulbs.

LED bulbs are primarily imported from China and Japan through sources in the U.S.. One local grower reported purchasing a relatively small number of LED bulbs via an internet transaction. A number of his new LED bulbs quit working after a short period of time! It is important that we all
proceed cautiously and identify sources of reliable LED products. A local importer of LED bulbs is offering an unconditional 5-year warranty on LED products if the bulbs are not dimmed and a 3-year warranty on bulbs that have been dimmed. Beware of inexpensive LED bulbs on the internet that are offered without a warranty. Even a warranty is only as good as the person or company behind it. Purchasing from a local person offering a warranty on bulbs is the safe method considering LED bulbs can be an investment of approximately $1500 per poultry house.

An Investment in LED Bulbs Pays for Themselves in a Short Time Period
A 500 ft. long house with two rows of lights will often have bulbs on 8 ft. centers in the brood chamber and 16 ft. centers in the off chambers. This layout requires about 48 bulbs in the brood chamber during brooding with 24 used during the rest of the growout. The off chambers require about 32 bulbs. The higher intensity 2 watt LEDs are likely necessary during brooding while the 0.7 watt bulbs should be fine in the off chambers and on 16 ft. centers in the brood chamber. While other lamp scenarios could be used that cost more or less, investing $1392 in LED bulbs would be required for each house under this example scenario.

LED Bulb Investment:
48 – 2W LED bulbs @ $18 = $864
56 – 0.7W LED bulbs @ $12 = $672
$1,536

The cost of typical incandescent bulbs to produce similar lighting would be about a dollar each, or $105. But remember, a typical incandescent bulb has a life between 1000 and 2000 hours while an LED bulb should last about 100,000 hours. How quickly could the extra cost of these LED bulbs be recovered?

For comparison purposes the following lighting program will be used as an example of a high light operation program:

<table>
<thead>
<tr>
<th>Flock Age</th>
<th>Chamber</th>
<th>Hours On</th>
<th>Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-7 days</td>
<td>Brood</td>
<td>23</td>
<td>High</td>
</tr>
<tr>
<td>8-21 days</td>
<td>Whole House</td>
<td>20</td>
<td>Low</td>
</tr>
<tr>
<td>22-49 days</td>
<td>Whole House</td>
<td>23</td>
<td>Low</td>
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</tbody>
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Assuming 48 – 100 watt and 56 – 40 watt incandescent bulbs in use as above, the electrical cost at $0.12/kwh would be approximately $341 per house per flock. Using comparable LED bulbs under the same program, the electrical cost at $0.12/kwh would be approximately $6 per house per flock. **LED bulbs would save $335 per house for each flock!** The LED bulbs would pay back their purchase cost in a little less than five flocks. Once paid back, LED bulbs would save growers over $1650 per year in electrical costs per 500 ft, 2 light line house using this lighting program. On top of that savings, remember that LED bulbs should last several years longer and the labor and cost of replacement bulbs will be eliminated.

Let’s Evaluate a Simpler, Less Costly Investment and Return in LED Bulbs
A grower might want to invest in only the low intensity LED bulbs at first before investing in two kinds of LED bulbs. A grower with a 500 ft. long house with two rows of lights might use low intensity LED bulbs (0.7 watt) on 16 ft. centers throughout the house and 100 W incandescent bulbs in alternate fixtures in the brood chamber. This layout requires investing in about 56 low intensity LED bulbs at a cost of $672. The house would still utilize incandescent bulbs (100 W) during brooding the first 7 days before only using LED bulbs.

LED Bulb Investment:
56 – 0.7W LED bulbs @ $12 = $672

Using the lighting program described above for comparison purposes and assuming an electrical cost of $0.12/kwh, the total cost of electric for lighting using incandescent bulbs would be approximately $341 per house per flock. Using 100 watt incandescent bulbs during brooding before using LED bulbs
under the same program would be approximately $51 per house per flock. **LED bulbs would save $290 per house for each flock!** The LED bulbs would pay back their purchase cost in less than three flocks. Once paid back, LED bulbs would save growers over $1450 per year in electrical costs per 500 ft., 2 light line house.

**Example Savings With a Program Using a Lower Amount of Lighting**

<table>
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<tr>
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<td>Whole House</td>
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<td>Low</td>
</tr>
<tr>
<td>36-49 days</td>
<td>Whole House</td>
<td>24</td>
<td>Low</td>
</tr>
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</table>

Using the high LED bulb investment case described above with this lighting program would save $228 per house each flock and pay back in less than seven flocks. If a grower used the low LED bulb investment case with this lighting program, they would save $180 per house each flock and pay back their bulb investment in four flocks.

**Where Can I Purchase LED Bulbs?**

Mr. Mack Malone, Tri-State Service of Salisbury, MD is a local manufacturer of LED bulbs. LED bulbs have applications in many different fields, yet Mack understands their use in the poultry industry. He is consistently bringing in new bulbs and working on techniques for important applications such as dimming. Mack can be reached by phone at: (410) 713-1331, or by email at: cmackmalone @verizon.net.

Mack has been working with a grower, Mr. John Ennis of Salisbury. John has installed LED bulbs in an entire house and would welcome visits from growers interested in seeing LED bulbs in use. He can be contacted by phone at (410) 546-3875.

Mack plans to have a booth at the Int. Poultry Trade Show later this month in Atlanta, GA and he will certainly attract a lot of attention for his products.

**Experiences with LED Bulbs to Date**

A number of growers that have purchased LED bulbs for their poultry houses are monitoring bird growth under this lighting. Early reports from growers are that they already see electric savings and the bulbs have performed reliably. The expected bulb failure rate is about 2% and these bulbs will be replaced under warranty. Birds seem to be migrating satisfactorily into LED lighted areas.

Since LED bulbs last significantly longer than incandescent bulbs, there is the chance they may rust into their socket. Growers can apply a coating of anti-seizing compound such as No-Alox to alleviate this.

For some growers, it might be wise to begin with LED bulbs in one house, then expand to use in the other houses on their farm after determining whether they are desirable. Be sure to purchase the bulbs from a reputable vendor.

If you have questions regarding the LED bulbs described in this newsletter, please call or e-mail me using the phone number and address provided below.

**Note:** Mention of a trade or brand names, specific manufacturers and vendors are used only for information. The University of Delaware does not guarantee or warrant the standard of any product mentioned, nor does it imply approval of any product to the exclusion of others that may also be suitable.

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