6-2011

Farm Energy: Energy fundamentals for farm lighting

Jay D. Harmon
Iowa State University, jharmon@iastate.edu

Dana Petersen
Iowa State University

Follow this and additional works at: http://lib.dr.iastate.edu/extension_ag_pubs

Part of the Agricultural Education Commons, Bioresource and Agricultural Engineering Commons, and the Oil, Gas, and Energy Commons

Recommended Citation
http://lib.dr.iastate.edu/extension_ag_pubs/30

Iowa State University Extension and Outreach publications in the Iowa State University Digital Repository are made available for historical purposes only. Users are hereby notified that the content may be inaccurate, out of date, incomplete and/or may not meet the needs and requirements of the user. Users should make their own assessment of the information and whether it is suitable for their intended purpose. For current publications and information from Iowa State University Extension and Outreach, please visit http://www.extension.iastate.edu.
Energy fundamentals for farm lighting

Lighting plays an important role on the farm. In addition to enhancing security around the farm property, lighting also provides an acceptable production environment for livestock, a safe work environment for farm employees, and the ability to perform work effectively after dark. This publication gives basic information about a variety of farm lighting options. Refer to additional publications in the Farm Energy series for more information regarding indoor and outdoor lighting applications.

Terminology

The table included on page 2 of this publication provides a brief overview of energy efficiency, rated life, relative cost and other features for different types of lighting. To compare lighting options, it is also important to understand basic lighting terminology:

- **Lumens**: Quantity of light produced by a lamp is measured in "lumens" (lm). A 60 watt (W) incandescent bulb produces about 780 lumens.

- **Foot-candles**: The level of lighting at a working surface. Light meters commonly measure light levels in foot-candles. One foot-candle (fc) is defined as the amount of illumination from a candle falling on a surface at a distance of one foot. A bright sunny day might have a light level outdoors of 8000 fc while a brightly lit desktop may be about 100 fc.

- **Average Rated Life**: The average number of hours that it takes for half of a given bulb type to burn out. This is determined under ideal conditions in a laboratory and actual life may be shorter. Factors impacting actual bulb life include: ambient temperature, humidity, dust, power surges and the number of on/off cycles.

- **Efficiency**: Lighting efficiency is measured in light production per unit of energy used. Units are Lumens/W (lm/W).

In addition to light fixtures, many farm buildings have windows or skylights that utilize daylight to supplement interior lighting needs. Keeping these surfaces clean and free of debris is helpful to allow as much sunlight as possible to enter the building.

Incandescent phase-out

Currently, incandescent bulbs are utilized for a variety farm lighting applications but they are scheduled to be phased out in the near future. Incandescent bulbs utilize electrical resistance to produce light and most of their energy is actually given off in the form of heat rather than light, therefore they are the least efficient type of lighting. This inefficiency and short bulb life make them a costly source of lighting in spite of their low retail price. Now may be a good time to consider alternative lighting options before incandescent bulbs are no longer available to purchase. The scheduled phase-out among U.S. retailers is:

- **100W incandescent** — January 1, 2012
- **75W incandescent** — January 1, 2013
- **60W and 40W incandescent** — January 1, 2014
<table>
<thead>
<tr>
<th>Lamp</th>
<th>Example</th>
<th>Typical Lamp Size (W)</th>
<th>Efficiency Lumens/W</th>
<th>Average Rated Life (hrs)</th>
<th>Minimum Start Temp (F)</th>
<th>Ballast?</th>
<th>Relative Cost</th>
<th>Typical Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incandescent</td>
<td><img src="image" alt="Incandescent Lamp" /></td>
<td>25-200</td>
<td>10-35</td>
<td>1,000-4,000</td>
<td>Below 0</td>
<td>No</td>
<td>$</td>
<td>Indoor/outdoor</td>
</tr>
<tr>
<td>Compact Fluorescent</td>
<td><img src="image" alt="Compact Fluorescent Lamp" /></td>
<td>5-57</td>
<td>50-80</td>
<td>6,000-12,000</td>
<td>0</td>
<td>Yes</td>
<td>$$</td>
<td>Indoor/outdoor</td>
</tr>
<tr>
<td>Cold Cathode Compact Fluorescent</td>
<td><img src="image" alt="Cold Cathode Compact Fluorescent Lamp" /></td>
<td>5-18</td>
<td>41-49</td>
<td>18,000-25,000</td>
<td>-10</td>
<td>Internal</td>
<td>$$$</td>
<td>Indoor/outdoor</td>
</tr>
<tr>
<td>LED</td>
<td><img src="image" alt="LED Lamp" /></td>
<td>6-20</td>
<td>4-150</td>
<td>35,000-50,000</td>
<td>Below 0</td>
<td>N/A</td>
<td>$$$$$</td>
<td>Indoor/outdoor</td>
</tr>
<tr>
<td>T-5 Fluorescent</td>
<td><img src="image" alt="T-5 Fluorescent Lamp" /></td>
<td>13-28</td>
<td>54-104</td>
<td>5,000-20,000</td>
<td>0</td>
<td>Yes</td>
<td>$$</td>
<td>Indoor/outdoor</td>
</tr>
<tr>
<td>T-8 Fluorescent</td>
<td><img src="image" alt="T-8 Fluorescent Lamp" /></td>
<td>15-36</td>
<td>58-98</td>
<td>5,000-20,000</td>
<td>0</td>
<td>Yes</td>
<td>$$</td>
<td>Indoor</td>
</tr>
<tr>
<td>T-12 Fluorescent</td>
<td><img src="image" alt="T-12 Fluorescent Lamp" /></td>
<td>14-60</td>
<td>42-98</td>
<td>7,500-30,000</td>
<td>50</td>
<td>Yes</td>
<td>$</td>
<td>Indoor</td>
</tr>
<tr>
<td>Metal Halide</td>
<td><img src="image" alt="Metal Halide Lamp" /></td>
<td>35-1,000</td>
<td>60-80</td>
<td>7,500-10,000</td>
<td>Below 0</td>
<td>Yes</td>
<td>$$$</td>
<td>Indoor high bays, outdoors</td>
</tr>
<tr>
<td>High Pressure Sodium</td>
<td><img src="image" alt="High Pressure Sodium Lamp" /></td>
<td>35-400</td>
<td>50-140</td>
<td>15,000-24,000</td>
<td>Below 0</td>
<td>Yes</td>
<td>$$$</td>
<td>Indoor/outdoor</td>
</tr>
<tr>
<td>Mercury Vapor</td>
<td><img src="image" alt="Mercury Vapor Lamp" /></td>
<td>40-1,000</td>
<td>10-63</td>
<td>16,000-24,000</td>
<td>Below 0</td>
<td>Yes</td>
<td>$$$</td>
<td>Indoor high bays, outdoors</td>
</tr>
</tbody>
</table>

Prepared by Jay Harmon, professor, ag and biosystems engineering and Dana Petersen, program coordinator, Farm Energy Conservation and Efficiency Initiative; Iowa State University Extension. Sponsored by the Iowa Energy Center.

... and justice for all
The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual’s income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA’s TARGET Center at 202-720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue SW, Washington, DC 20250-9410, or call 800-795-3272 (voice) or 202-720-6382 (TDD). USDA is an equal opportunity provider and employer. Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914 in cooperation with the U.S. Department of Agriculture. Gerald A. Miller, interim director, Cooperative Extension Service, Iowa State University of Science and Technology, Ames, Iowa.