Kentucky Poultry Federation

Cheeps & Chirps

…… Points for Poultry Profitability

VOLUME 4, ISSUE 1 APRIL 2011

INSIDE THIS ISSUE:

HOW MUCH ELECTRICITY ARE YOU USING?

The goal of the poultry house evaluation service (PHES) was to identify areas where there may be potential to reduce energy costs and, in some cases, increase income to the producer through improved production. In order to evaluate the magnitude of any reduction it is important to know your current energy usage.

The amount of electricity used varied considerably among the producers participating in the evaluations (see Figure 1 below). The amount of electricity used is converted to per kg of broiler produced. There was a 2-fold difference between the lowest and highest user of electricity, but they both received the same income from the broilers produced.

What is your electricity consumption? To determine you electrical consumption divide the total kWh used during a two year period (to account for any year to year fluctuations), preferably on a per house basis if possible, by the kg of meat produced. Then multiply by 1,000. For the producers in the study, the highest usage was 126.5 kWh/1,000 kg of broilers sold, and the lowest was 62.4. The average was 87.6.

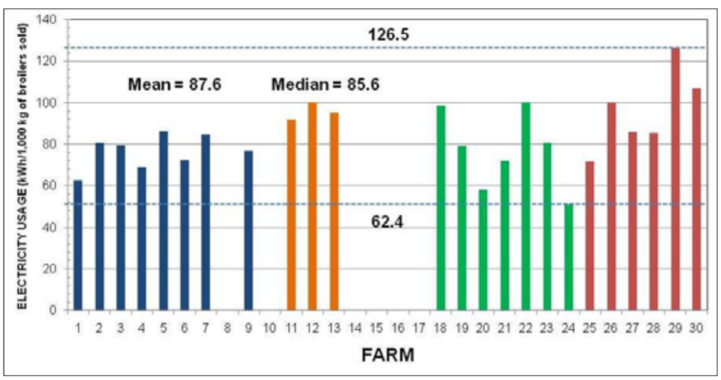

Figure 1. Electrical use (2007-2008) for the farms participating in the evaluations.

LIGHTING ALTERNATIVES

One energy-saving recommendation is to change from incandescent lights to cold cathode or compact fluorescent lights. When you make the change you get similar light levels for about a quarter of the energy consumption and cost, and substantially longer life bulbs. The payback period varies from a few months to a couple of years, depending on the system used.

There are a number of alternative light sources available. The main difference between them is the method by which they produce light. In an incandescent bulb electricity is passed through a thin tungsten wire to heat it, resulting in the incandescence we see. The problem is that over 90% of the energy used is released as heat rather than light. Fluorescent and high pressure sodium bulbs produce light by passing electricity through a gas or a mixture of gases. Fluorescent bulbs use a low pressure mercury discharge which initially produces a high proportion of radiation in the UV range, which we can't see. The phosphor that coats the inside of the glass tube converts this to wavelengths that we can see. A low pressure sodium lamp uses neon as a starting gas while high pressure sodium lamps use a xenon starting gas and a mercury buffer gas.

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LIGHTING ALTERNATIVES ... *Continued*

Incandescent

CFL—spiral

Cold cathode

HPS

(Continued from page 1)

When selecting an alternative light source it is important to consider dimming requirements, up-front costs, bulb lifespan and quality of light produced.

Incandescent lamps have low up-front cost but have an average lifespan of only 1,000 hours (approximately 2 months if lit an average of 16 hours/day). They can be dimmed to a low light level and produce a consistent light color.

Compact fluorescent (CFL) bulbs cost more than incandescent bulbs, increasing the up-front costs, but they have an average light span of about 10,000 hours (almost 21 months if lit an average of 16 hours/day). According to EPA, CFLs use about 75% less energy than incandescent bulbs. A 23-watt CFL will emit the equivalent brightness of a 100-watt light bulb. Unfortunately the standard CFL cannot be dimmed. The bulbs also have a problem with a possible decrease in light levels late in their lifespan. You can buy Energy Start rated bulbs which are guaranteed to perform at higher than 80% of their original brightness after 4,000 hours of use. You can also buy bulbs with a slightly higher wattage than would normally be required so that the light levels do not fall below a minimum level late in its lifespan.

The most commonly used CFL bulb is the spiral. The spiral design makes it hard to clean the dust and dirt that accumulate. They can be purchased with a globe covering the spirals to help with ease of cleaning, but there is an additional cost.

Dimmable CFLs are now available but they are currently inconsistent in dimming ability to the low levels used in poultry houses. They are also more expensive than traditional CFLs.

Cold cathode bulbs have an average life span of about 25,000 hours (about 52 days if lit an average of 16hours/day). They come with a globe surrounding their lighting mechanism making them similar to incandescent bulbs in terms of ease of cleaning. They consume slightly more energy than spiral CFLs but they are considerably more efficient than incandescent bulbs. An 8-watt cold cathode bulb corresponds to a 40-watt incandescent bulb. The main advantage that cold cathode bulbs have over CFLs is that they can be accurately dimmed to the low light intensities required in a poultry house.

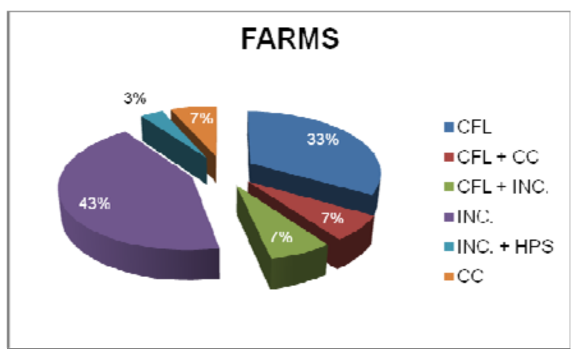
Most recently, LED lights have become available. They have an average life span of approximately 50,000 hours. They also come in a variety of colors and options.

Tube fluorescents require new lighting fixtures, which increases the payback period. They have a light output that is similar to CFLs but have a higher energy efficiency. They have not become popular because of the need to install new fixtures. In addition, because the bulbs are installed inside large fixtures cleaning the bulbs is also more difficult.

High Pressure Sodium (HPS) are extremely efficient with about 95 lumens per watt. Unfortunately this is offset by a costly installation of fixtures and the inability to dim to low light levels.

Figure 2 shows the types of light bulbs the participating producers had. While many have changed to energy-saving bulbs of one kind or another, 43% are still using incandescent bulbs. The majority that have switched changed to CFLs. If you are looking to reduce your energy costs changing out your light bulbs. Depending on your initial energy costs, payback is typically within 2 years.

Figure 2. Types of light sources used by the farms that participated in the PHES energy audits



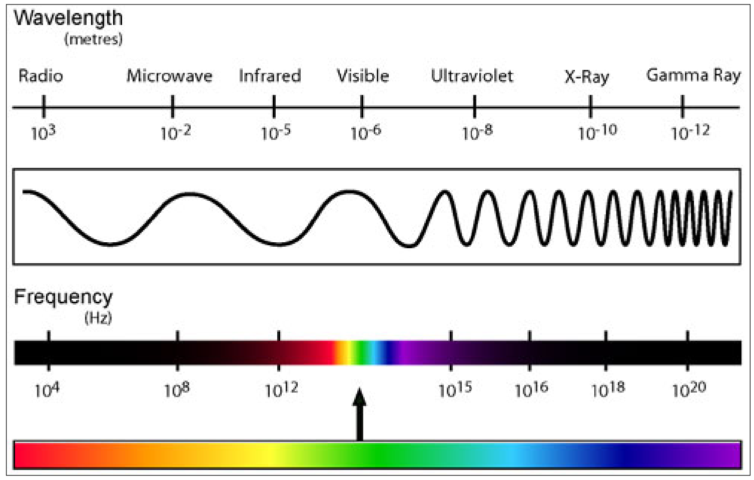
CFL=Compact Fluorescent;
CC=Cold cathode;
INC=Incandescent;
HPS=High Pressure Sodium vapor

LIGHTING UP THE POULTRY BARN

Everyone knows we need light to see where we are going, but light is also important for its regulation of various biological activities in our bodies. But what is light?

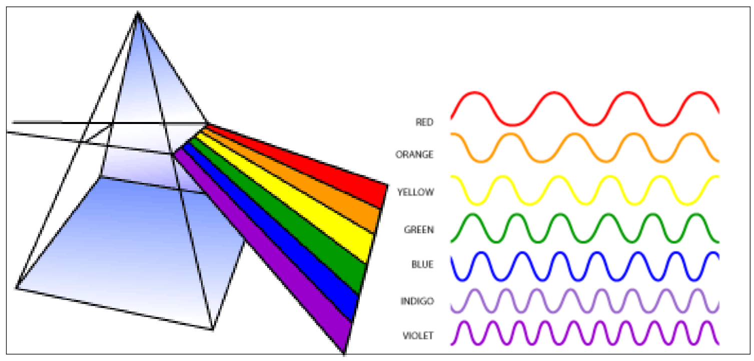
Light is a form of energy and it travels in a wave-like behavior similar to ocean waves. Not all ocean waves are the same—just ask a surfer! They come in different sizes and speeds. Like ocean waves, different forms of energy have different sizes and frequencies. The range of energy types is known as the electromagnetic spectrum. This spectrum includes things we cannot see like radio waves, microwaves, infrared (IR) radiation, ultraviolet (UV) radiation, x-rays, and gamma rays. The part of the spectrum that we can see is known as visible light (see Figure 3).

Figure 3. The electromagnetic spectrum



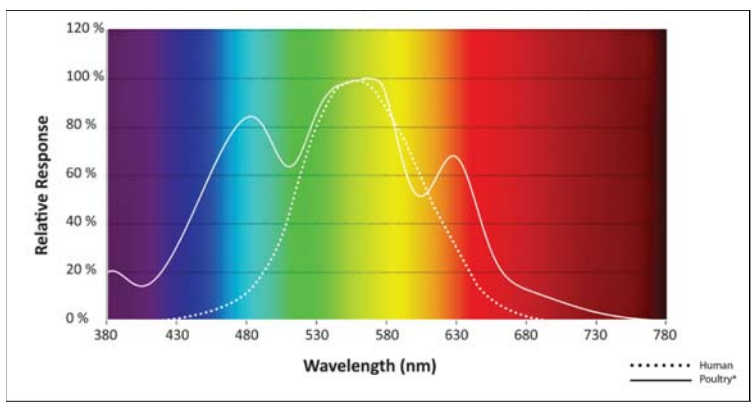
The typical human eye responds to wavelengths of about 390-750nm. Different colors in the visible light spectrum have different wavelengths (see Figures 3 and 4). Some colors, such as pink and magenta, are not included in the spectrum. Such colors require a mix of multiple wavelengths. There is also no 'white' light. Natural white light is simply a combination of different color wavelengths. Think of light going through a prism which separates the different wavelengths (see Figure 4).

Figure 4. Comparative wavelengths of different colors



Poultry and humans have different sensitivities to visible light (see Figure 5). Both have peak sensitivity in the green spectrum. This makes sense since the primary habitat of both species was originally under green forest canopies. Poultry are also sensitive to red and blue light and can see ultraviolet light that humans cannot. Because poultry can see light in a wider spectrum, perceived light intensity is considerably higher for poultry than for humans.

Figure 5. Human and poultry spectral sensitivity



When selecting a light source it is important to consider the spectral composition of light produced. The intensity or amount of energy in each wavelength band varies with the lamp type. Artificial light sources vary in their spectral output and can be either broad spectrum (contain light of a wide range of wavelengths) or a narrow spectrum. Natural daylight is a broad spectrum and high intensity light source. Incandescent lamps have a broad, continuous spectra with most of their output in the longer wavelengths (see Figure 6). In contrast, fluorescent lamps produce a combined spectrum with a continuous spectrum from the phosphor they contain plus a line spectrum from the mercury. High-intensity discharge lamps such as high-pressure sodium vapor lamps, produce a narrower spectral output. High-pressure sodium lamps produce light with yellow to red wavelengths.

There are three main differences in the eyes of humans and birds. Color is perceived with cones in the retina of the eye. The types of cones differ between species. In addition, humans have three types of cones while poultry have four. As a result, chickens perceive light differently than we do.

In addition to perceiving light through the eyes, birds also perceive light through the top of their head. The light is able to penetrate the feathers and skull and affect certain areas of

(Continued on page 5)

FAN MAINTENANCE, ANOTHER ENERGY SAVER

It is the fan belt and pulley that determines the RPMs of a fan.

Tightening a worn belt does not cure the problem, it needs to be replaced.

If shutters and blades are allowed to become caked with dust, fan performance can be cut by as much as 30%.

Part of the poultry house evaluation program included testing the fans for efficiency. The Fans Assessment Numeration System (FANS) unit (see Figure 7) uses a horizontal array of five propeller anemometers (the instrument used for measuring wind speed) to obtain real-time airflow measurements as the array is moved up and down along the fan. To test a fan, the FANS unit is position in front of the fan and sealed to the wall using duct tape. Measurements are taken at six static pressures ranging from free air to approximately 0.2 inches of water column.

Fan revolutions per minute (RPMs) and air movement (cubic feet per minute) are directly related. For example, a fan turning 10% slower in RPMs moves 10% less air. Similarly, a fan turning 15% slower moves 15% less air than normal. Proper fan installation and maintenance is required to maintain house conditions that are optimal for bird growth and feed conversion.

Fan blades and shutters should be checked on a weekly basis. Previous research has shown that if shutters and blades are allowed to become caked with dust, fan performance can be cut by as much as 30%. This means that a fan delivering 400 RPMs when clean may deliver only 420 RPMs when dirty.

Dirty shutters

Figure 7. Equipment used in the fan evaluations during PHES farm visits

It is the fan belt and pulley that determines the RPMs of a fan. As a fan belt wears, it becomes thinner and rides deeper in the pullet than when new. The effect is exactly the same as installing a smaller motor pullet: the fan RPM speed is reduced. Tightening a worn belt does not cure the problem, it needs to be replaced.

Old belt

New belt

LIGHTING UP THE POULTRY BARN *(continued)*

(Continued from page 3)

the brain. The hypothalamus in the brain is able to identify the wavelengths, intensities and duration of light and translates this into chemical and hormonal signals. These signals in turn influence the bird's reproductive glands and organs. As a result, they effect semen and egg production.

In general, body weight and feed efficiency of broilers raised to 42-70 days of age is not significantly affected by light source. The choice of light source, therefore, does not effect broiler performance.

An effect has been shown of light wavelengths on broiler breeders. While all available artificial light sources can support egg production, breeders have been reported to respond better to the longer wavelengths of visible light. Cool white fluorescent lights do not produce much visible light in the longer wavelengths. High Pressure Sodium vapor lamps and broad spectrum fluorescent lights are good sources of light for broiler breeders.

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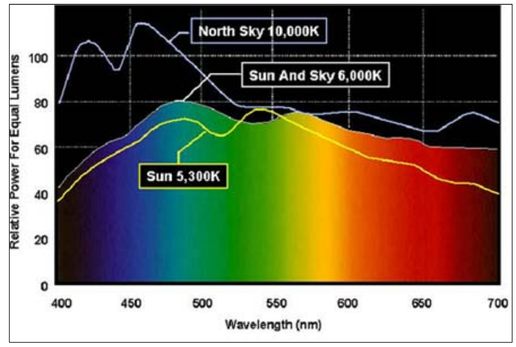
Spectral sensitivity of the domestic fowl by N.B. Prescott and C.W. Wathes. British Poultry Science 1999 (40):332-339.

Poultry and coloured light by P.D. Lewis and T.R. Morris. World's Poultry Science Journal (2000) 56:189-207.

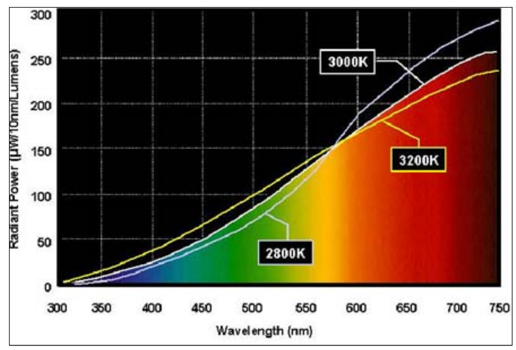
Responses of domestic poultry to various light sources by P.D. Lewis and T.R. Morris. World's Poultry Science Journal (1998) 54:7-25.

Figure 6. Typical spectra for different light sources

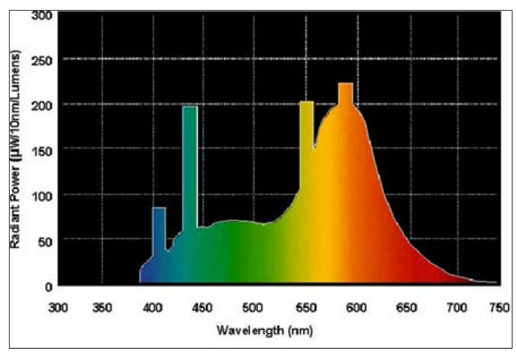
A. Natural day light



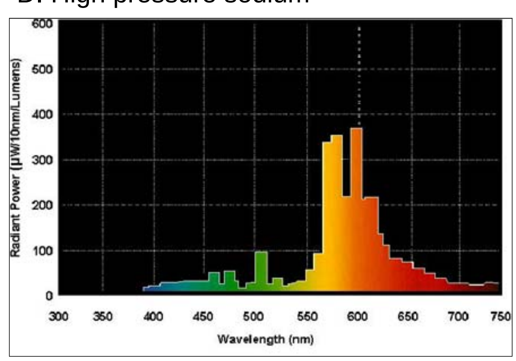
B. Incandescent



C. Cool white fluorescent



D. High pressure sodium



Source: GE lighting (www.gelighting.com/na/business_lighting/education_resources/learn_about_light)

ISSACS JOINS KPF AS EXECUTIVE DIRECTOR

Our new executive director, Geri Issacs, lives on a Woodford County farm where she, her husband and son raise table grapes, alfalfa, corn and cattle.

Geri has over thirty years experience in agriculture. She overcame her suburban upbringing when she married a farmer and moved to a large cattle and row crop farm in upper east Tennessee where she learned to doctor cattle, work in tobacco, and determine the width of a gate relative to a disc.

Geri has been a teacher, a writer, and a development professional—all positions which required that she be able to communicate clearly and effectively with different audiences. In her new position with KPF she expects to make good use of these skills. "I want to make clear to everyone—producers and potential producers, consumers, policymakers—the role poultry plays in Kentucky agriculture.

Kentucky Poultry Federation
P.O. Box 577
Winchester, KY 40392
Phone: 859.737.1048
Fax: 859.737.1049
E:mail: melissamiller@kypoultry.org

Visit us on the web!
www.kypoultry.org

ENERGY IMPROVEMENT GRANTS

Several poultry growers have successfully participated in the USDA Rural Development program that provides financial assistance (grants and guaranteed loans) for energy efficiency improvements. The program can provide up to 25% of the installed cost of improvements such as insulating walls or ceilings, adding attic inlets, installing tunnel doors, or changing to energy efficient lighting. Other improvements can also be eligible as long as they help reduce the amount of fuel or electric energy used to operate the poultry farm. Only those costs incurred after an application is submitted are eligible for the cost share.

Growers can still submit applications for the current year funding cycle. A cut-off date has not been announced but is probably coming within a month or two. Applications are rather extensive and most projects will require an energy audit, so it takes some time to assemble the necessary information and documents. The first step for those who are interested is to contact one of the grant writers who can explain more about the application process and help put all of the material together. Contact information for some people in Kentucky who can assist with applications is available online or by emailing Jacquie Jacob (Jacquie.jacob@uky.edu).

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