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The changing light bulb

New technology and energy efficiency concerns are changing the way we light our homes and greenhouses. The governments of many countries, including the United States, have passed laws that ban the use of most incandescents for general lighting. The T-12 fluorescent bulb is also being eliminated for more efficient T-8 and T-5 bulbs.

Starting January 1, 2012, 100-watt incandescents have been removed from the shelves. The Energy Independence and Security Act of 2007 requires manufacturers of light bulbs that produce 310-2,600 lumens of light to increase efficiency by 25 percent or more before 2014. By 2014, 40, 60 and 75 watt will not be available. There are good reasons for this. Light output for a 100-watt incandescent is about 1,630 lumens or 17 lumens/watt. About 90 percent of the electricity supplied goes into heat and only 10 percent into light. Although they are inexpensive, their average life is only about 1,000 hours. Other types of bulbs are more electricity efficient.

Tungsten-Halogen bulbs

These are a comparable replacement with a me-



The T-12 (1.5" diameter) fluorescent bulbs are being phased out to be replaced by the smaller T-8 and T-5 models.

dium screw base that fits the incandescent socket. This is basically an incandescent lamp with tubular quartz glass and an iodine vapor. It has uniform light output over its 2,000-hour life. These bulbs are 10 to 40 percent more efficient than incandescent due to the higher filament temperature.

Fluorescent bulbs

There are also many sizes and styles of the compact fluorescent (CFL) bulbs that will fit a medium screw base. CFLs use about one-fifth the energy of an incandescent to generate the same amount of light as an incandescent bulb. Their life is 10 times longer so replacement costs are very

low. Fluorescent bulbs require a ballast to provide adequate voltage for starting the electrical discharge and limit the current. CFLs have an integral ballast in the base of the bulb. Compact fluorescents contain mercury and must be disposed of properly to avoid its release.

As of July 14, 2012, the T-12 (1.5 inch diameter)

fluorescent tube will no longer be produced for commercial and industrial applications. The T-8 (1 inch diameter) will become the standard. The standard 40 watt is replaced with a 32-watt bulb. The T-5 (5/8 inches diameter) is a more recent development and provides even higher efficiency. Both use electronic ballasts. The bulbs are not interchangeable as a standard T-8 is 48 inches long and a standard T-5 is only 45.2 inches long. The fixtures are more expensive but due to the higher efficiency and longer life, the payback is fairly short. The fluorescent tube is still the standard for growth rooms where plants are grown on stacked shelves. The cool surface and linear light can provide more uniform light levels over the crop. To get higher light levels, the high output or very high output bulbs should be selected.

Metal Halide and High Pressure Sodium

In greenhouse operations, these bulbs are used mainly for supplemental plant lighting and room lighting in the headhouse. The metal halide (MH) uses iodides in addition to mercury to get a near white light. High pressure sodium (HPS) gives yellow-orange light that is produced by passing an electric current through vaporized sodium under pressure at high temperature. These bulbs require several minutes to reach full light output when they are turned on.

Research has improved the performance of the bulbs used

BULB COMPARISON

Bulb	Average life	Lumens/watt*
Incandescent	1,000 hours	15 - 18
Tungsten - Halogen	2,000	15 - 20
Compact fluorescent	10,000	50 - 65
T-12 fluorescent	15,000	30 - 40
T-8 fluorescent	20,000	80 - 100
T-5 fluorescent	20,000	90 - 110
Metal Halide	15,000	90 - 100
High pressure sodium	24,000	90 - 100
LED	50,000	60 - 90

*A measurement of light output. The amount of light emitted by one candle that falls on one square foot of surface at a distance of one foot. Lumens/watt is the amount of light per watt of electricity input to the bulb.



Spectrum enhanced metal halide and sodium vapor bulbs have been developed to increase plant growth.

for plant growth. The Agrosun metal halide and sodium vapor bulbs have spectral enhancements that emit more red wavelengths to increase flowering and fruiting. Sun Pulse bulbs are available in several different temperature ratings (3K to 10K) for different stages of growth. These bulbs provide higher

efficiency when they are used with electronic digital or HPS magnetic ballasts.

LEDs (light emitting diodes)

The LED is the new light source for greenhouse crops. In time it may replace most of the other types. LEDs are about 85 percent more

efficient than incandescents and last 50 times longer. They produce very little heat and can be dimmed and cycled easily. The tiny bulbs are manufactured in several colors, and getting the right combination for plant growth is being researched throughout the world. In the future you may see light banks similar to the large roadside billboards that are controlled by computer. The spectrum can be changed as needed: Phillips Horticultural Lighting has developed several products for overhead, intercrop and multilayer applications. The spectrum can be adjusted to suit the needs of the crop by changing light modules. Currently the market is being flooded with cheap LED products manufactured overseas. Some of these have low light levels, poor energy savings and a short life. **GM**

? HAVE A QUESTION? You can write John at jbartok@rcn.com.