Saving Energy

on Electric, Lighting and Water S

Proper installation and maintenance of all electronic systems can lead to significant savings in monthly overhead.

By John W. Bartok, Jr.

If you talk to a grower, one of the most costly problems mentioned is the high electric bill. For most greenhouse operations, the electric bill is about 5-10 percent of the total energy cost and covers such items as the power to run motors, lights, heating elements and controls. A typical bill for a 1-acre greenhouse can exceed $1,000 per month.

The demand for electricity has been increasing rapidly over the last few years due to greater use of electronic devices and machinery. In many sections of the country, electric utilities are operating at maximum output. The new plants now coming on-line are usually peaking facilities that are meant to pick up the slack during times of high demand. While cheaper and easier to build, they do not provide baseload power.

Deregulation, in the states that have it, has not done much to control electricity costs. There is not much incentive to build new plants when companies are being forced to sell their generating capacity. Companies that purchase these plants can sell the electricity for whatever the market can bear.

Conservation may be the only way that growers have to offset the rise in energy costs. Proper installation and maintenance are two ways to achieve significant savings.

ELECTRICAL SERVICE

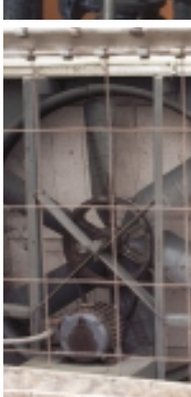
Your electrical service must be of adequate size to handle the load. Adding greenhouse space frequently overloads the system and causes circuit breakers to trip.

In calculating load, it is necessary to make a complete list of electrical equipment, giving full-load amperes and operating voltage. Next, identify the equipment that will be operating simultaneously. This has a demand factor of 100 percent. The next 60 amps of all other loads are assigned a demand factor of 50 percent, with the remainder assigned at 35 percent. An additional amount, usually 25 percent, should be added for future expansion or for additional equipment.

To avoid multiple base charges, all the greenhouses and accessory buildings should be served by one electrical service. It is usually less expensive if a farm rate can be obtained rather than a commercial rate that has an associated demand charge.

WIRING

To meet the National Electric Code, the wire type should have insulation to fit the application: wet, dry or high-temperature. In many greenhouse locations, especially where moisture and dust are present, the code



Top: Electric service s plus 25 percent for ex protect switches and Motors and fans shou be adjusted to provide photos courtesy of Joh

requires that the wiring be placed in conduit. Polyvinyl chloride (PVC) conduit is a good choice as it is corrosion-resistant, watertight and easy to install. Watertight electrical boxes and receptacles should also be included in the system to keep out moisture and dust.

One problem common in greenhouse operations is using wire that is too small for the size of the load. This is a frequent cause of fan and furnace motors overheating and failing. It also uses extra electricity that is converted to heat in the wires. An electrician can provide information on the correct wire size. The size is based on the amount of amperage, length of wire and type of insulation.

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check the voltage and current when the motor is operating.

A defective motor should be replaced with one of the same horsepower rating and voltage. Today, consideration should be given to installing a high-efficiency model. These motors use more electrically conductive materials than comparable standard motors and convert more electrical energy input into mechanical, load-driving output.

For example, a 1-horsepower, capacitor-start motor operating on 115 volts draws 13.6 amps, whereas a similar, high-efficiency motor will draw only 9.2 amps, a 32 percent saving. High-efficiency motors cost slightly more initially, but this cost is quickly recovered. Check with your electric company to see if there is a rebate program for the replacement of inefficient motors.

LIGHTING

Selecting the right light source can save money on the electric bill. With an average of 16 lumens per watt and 1,000 hours average life, incandescent lamps should not be used anywhere in your operation. Fluorescent lamps in 4- or 8-foot lengths, or the newer compact design, will give about 75 lumens per watt and operate for 12,000 hours. Although the initial cost is greater, the savings in electricity will pay this back quickly. Cool white fluorescent bulbs also give a light spectrum close to sunlight.

For areas that are lighted for long periods of time, high-intensity discharge lighting may be a better choice. These produce light when an electric current is passed through a gas or vapor under pressure. Efficiency is about the same as fluorescent, but the life of the bulb can be up to 20,000 hours. Metal halide gives a white light and is good for work areas. High-pressure sodium provides a yellow light and is slightly more efficient with about 110 lumens per watt.

Lighting should be installed to provide adequate but not excessive light for the task that is being done. For potting, transplanting and office areas, 20-25 foot-candles (ft-c) are needed. For storage areas, 10 ft-c are enough. Use an inexpensive light meter to check the level.

Supplemental plant lighting in a greenhouse may be required at levels of 500-1,500 ft-c. To save on energy, a computer system should be installed that integrates the daily sunlight with enough hours of supplemental light to provide for the needs of the plants, but not an excessive amount.

For all tasks, a uniform pattern of light should project over the work or plant area. This requires careful

the lights operate for 12 hours a day or longer. Installing motion detectors to control the light can produce significant savings; it has been found that trespassing and break-ins occur less frequently if the lights are not on all the time.

WATERING SYSTEMS

At an electric rate of 12 cents per kilowatt-hour, most nonmunicipal pump systems will supply about 50 gallons of water per one cent. Making good use of the water helps reduce the electric bill.

For each pound of fresh matter produced, as many as 2.5 gallons of water move through the plant. With many irrigation systems to choose from, it is important to select one that will provide adequate water without

will save up to $2.00 per linear foot of pipe per year, and the payback is usually less than one year.

With the many pipe fittings and connections in a greenhouse, drips are inevitable. A faucet dripping at 60 drops per minute will waste 113 gallons per month. If this water is heated with electricity at $0.11 per kilowatt-hour, it will cost $3.50 per month.

POWER GENERATION IN THE FUTURE

The future of power generation and distribution is being researched. Photovoltaics, the direct conversion of sunlight to electricity, has been under development for many years. Solar panels are presently expensive and economically feasible only in areas where power lines are expensive to install. Future green-