

Using Automated Systems in the Greenhouse

A GREENHOUSE company outside Chicago produces more than a million potted poinsettias a year. Imagine the labor involved in potting, moving, and watering all those plants! Growing so many plants would be extremely difficult if it were not for automated systems.



Objective:



Assess automated systems used in the greenhouse industry.

Key Terms:



- automated pot fillers
- automated seeders
- automated transplanters
- capillary mats
- conveyor belt systems
- drip irrigation
- ebb-and-flood system
- intermittent mist system
- irrigation boom
- overhead sprinklers
- spaghetti tubing
- tray mechanization

Automated Systems

Automated systems incorporate technological developments into the production of greenhouse crops. The labor involved in propagating, potting, moving, growing, and harvesting greenhouse crops is intensive. Automated systems can greatly reduce labor costs. They also allow for the management of much larger greenhouse operations.

Automated systems speed the planting and transplanting processes. **Automated pot fillers** are used to fill pots with medium. The medium is lightly packed, and the pots are stacked or move down a conveyor for planting. **Automated seeders** permit the sowing of entire flats or plug trays in a few moments. The finished flats or trays move down a conveyor to a germination room or are taken right to the greenhouse. **Automated transplanters** remove small plants from plug trays and transplant them directly to pots.

One of the most labor-intensive tasks in the greenhouse is the transporting of plants. **Conveyor belt systems** are used to move plants from one area of the greenhouse to another. **Tray mechanization**, first developed in Holland, has grown in popularity in the United States. Individual trays or palletized benches that hold 100 pots or more roll on a series of rails from one area to another. The rail systems connect greenhouses to one another and to the headhouse, where plants can be packaged for shipment.



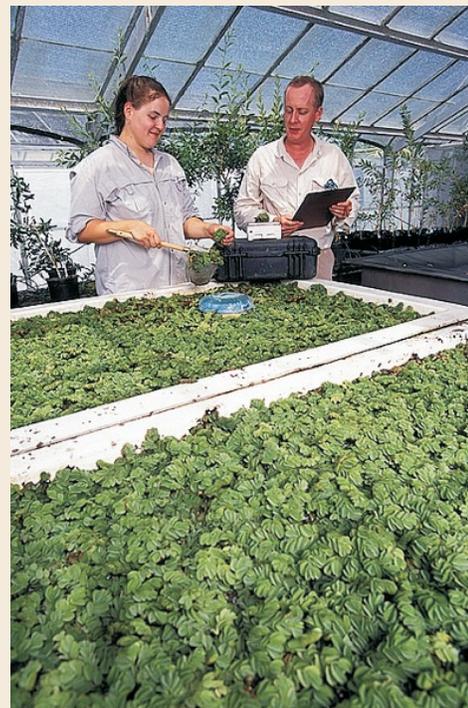
ON THE JOB...

CAREER CONNECTION: Horticultural Engineer

People who design greenhouses and automated greenhouse systems are often trained as horticultural engineers. Horticultural engineers require knowledge of a variety of disciplines, including engineering, plant science, and computer science.

Responsibilities of horticultural engineers may include work toward more effective and efficient growing systems. These individuals may also search for ways to apply new technologies that result in more cost-effective production of greenhouse plants.

Training for a career in horticultural engineering often begins at the secondary level. Students may take classes in horticulture or agriculture and in advanced mathematics. Horticultural engineers must earn a bachelor's degree to be considered for most jobs. Further education resulting in postgraduate degrees expands employment opportunities.



WATERING SYSTEMS

Although hand watering is the most reliable method of watering, automated systems permit the watering of thousands of plants in a short time. Spaghetti tubing, drip irrigation, ebb-and-flood systems, capillary mats, irrigation booms, overhead sprinklers, and intermittent mist systems are all methods used in watering plants.

Spaghetti tubing is an automated system that involves small tubes connected to a main line. The end of each small tube is placed in a pot and, when functioning, dribbles water onto the medium. One advantage of spaghetti tubing is that the flowers and foliage stay dry.

Drip irrigation consists of a system like spaghetti tubing, but it differs in that it provides a slow, steady drip. Drip irrigation is commonly used with hanging baskets. The advantage of drip irrigation is that it wastes less water and fertilizer than spaghetti tubing.

An **ebb-and-flood system** involves watertight benches in which pots are set. Water or nutrient solutions are pumped into the benches, the medium absorbs the water, and the excess water drains away. Little if any water is lost with such a system, nutrient levels are easily adjusted, and plant foliage is kept dry.

Capillary mats consist of porous mats placed on a bench and wetted. The medium in the pots absorbs the water through capillary action. This method is commonly used with African violets because the foliage stays dry and humidity around the plants is high.



FIGURE 1. Spaghetti tubing.



FIGURE 2. Ebb-and-flood system.

An **irrigation boom** moves across the entire bench, and well-placed nozzles flood the pots below as they pass over the plants. This method is commonly used with bedding plants, plug trays, and some potted flowering crops.

The watering system involving **overhead sprinklers** consists of stationary sprinkler heads placed throughout the growing space. They deliver a large amount of water in a short period and are often used with bedding plants.



FIGURE 3. Irrigation boom.

An **intermittent mist system** produces tiny droplets in the air for keeping plant material wet. Such a system is commonly used in the propagation phase of production to reduce water stress on propagation materials. The mist can operate continually or be programmed to operate for a certain number of seconds every set number of minutes.

Summary:



Automated systems incorporate technological developments in the production of greenhouse crops. Automated systems can greatly reduce labor costs and allow for the management of large greenhouse operations.

Automated pot fillers are used to fill pots with medium. Automated seeders permit the sowing of entire flats or plug trays in a few moments. Automated transplanters remove small plants from plug trays and transplant them directly to pots.

Conveyor belt systems are used to move plants from one area of the greenhouse to another. Tray mechanization involves individual trays that hold 100 pots or more and roll on a series of rails from one area to another.

Although hand watering is the most reliable method of watering, automated systems permit the watering of thousands of plants in a short time. Spaghetti tubing, drip irrigation, ebb-and-flood systems, capillary mats, irrigation booms, overhead sprinklers, and intermittent mist systems are all methods used in watering plants.

Checking Your Knowledge:



1. What are the advantages of automated greenhouse systems?
2. What type of automation is used in the planting of crops?

3. What automated systems have helped with the moving of crops?
4. What are the various automated watering systems?
5. What are specific advantages of ebb-and-flood and intermittent mist systems?

Expanding Your Knowledge:



Visit a greenhouse business that has automated systems used for production. Ask the grower to explain the operation of the systems and the advantages of each.

Web Links:



Irrigating Greenhouse Crops

<http://aggie-horticulture.tamu.edu/GREENHOUSE/NURSERY/GUIDES/ghhdbk/irriga.html>

Mechanization and Labor Saving for the Small Grower

http://www.umass.edu/umext/floriculture/fact_sheets/greenhouse_management/jb_labor_smgr.htm

Seeders and Transplanters: How Do They Benefit the Greenhouse Operation?

<http://www.greenhousebiz.com/story1.htm>