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The XY System, Part II

The ultimate piece of automation for labor savings and system integration.

By Mike Porter

My previous article (June 2003 *GPN*) described a new piece of automation recently put into operation: the XY system. The specific growing range I described as an example was a new 17-acre facility, and the XY system enables all movement of material in and out of the greenhouse to be operated by one person. I suspect many people were skeptical of the applicability of such a system to the U.S. market. After all, how many growers are in a position to build a new 17-acre range?

The reality is that even though few growers ever entertain a project of that magnitude, the XY concept is applicable to much smaller projects. A manager planning for the growth of his 5- to 6-acre operation would probably find the system affordable and justifiable. For growers who wish to automate existing operations, variations and hybrids of the system are very feasible. A system similar to that described in my previous article could be installed in a new 6-acre range for less than \$3.50 per square foot. And the system, which works in conjunction with overhead watering, does not require concrete floors, which themselves often cost \$3.50 per square foot. We are not talking about a prohibitively expensive system.

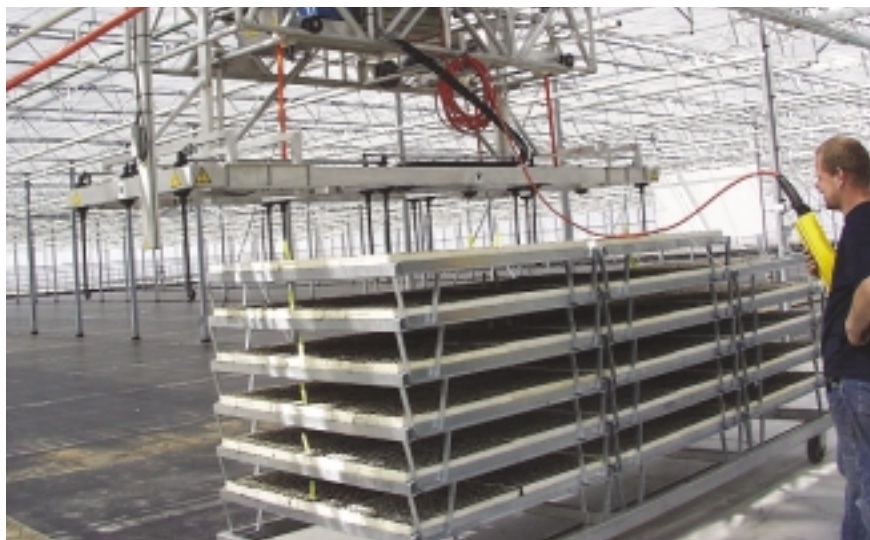
SOME MORE DETAILS

Let's start by reviewing the XY System in more detail and look at some optional components.

Placing and removing. The core of the system is a pick and place unit that places and removes material from greenhouse bays (the Y direction). The unit is driven by an operator and can selectively pick

anywhere in each bay. This unit in our example was sized to pick 48 carriers or approximately 440 sq.ft. of material at capacity. Its size coincided with the 30-foot width of the greenhouse bays. It rides into the

Small overhead cranes can and are being used in both new and existing facilities. These cranes can ride on the same rails as booms, provided the rails and greenhouse are designed to handle the load. Two people would



Above: Cranes are a more commonly used XY component in U.S. greenhouses. Below: Pick and place units can be designed to run on rails such as these, eliminating the need for concrete floors.

bays on steel rails, which eliminate the need for a concrete floor. For a 6-acre range, a pick and place unit would cost less than \$1 per square foot, which will vary somewhat with size of operation.

Other options are available to perform the pick and place function.

normally be required to move the crane from bay to bay. Most recently constructed greenhouses have sufficient under-gutter height to accommodate cranes. Both the cost and the capacity of these systems are typically less than the unit described above. Cranes normally select one carrier

per cycle, though carriers will normally be larger than those described above (a bench with a crane, a flat with an XY). Consequently, crane systems will have somewhat less flexibility than XYs, even though it is still easy to select material from anywhere in the bay.

Moving. The second element in the system is the mechanism to move material to and from the headhouse and shipping area (the X direction). In new XY systems, this is accomplished by a transport robot that rides on a concrete transport aisle, is electrically powered and requires no operator. The cost of one of these shuttle cars is approximately the same as the pick and place unit. The shuttle unit is also used to move the pick and place unit from bay to bay. More than one shuttle may be needed to maximize the capacity of the pick and place unit.

Many U.S. growers have justifiable concerns about unmanned robots in the workplace. The new XYs do require a very wide transport aisle, which can be planned in a new operation but is not viable in an existing operation. However, other options are available. 1) In the simplest scenarios, movement in the X direction can be accomplished by traditional means such as a train of carts or trailers; 2) the shuttle car could be operated by a person; 3) the size of the shuttle car could be reduced to accommodate narrower transport aisles, though most newer greenhouse ranges have transport aisles wide enough to accommodate a shuttle car; 4) capacity may be reduced and still be more than adequate for a smaller range and 5) if benches are used as a carrier, traditional powered or

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unpowered transport lines could be used to perform the function of the shuttle car. Again, every decision made with regard to the shuttle device must be integrated with all other elements of the system.

Holding. The third element of any XY system is the carrier or the actual device holding the flats, packs or pots. Carriers, such as the ones in the example we've been using, can be specially designed with a number of features. They can be made to the same size as cart shelves, designed to work in conjunction with flood floors, designed to stack on a traditional cart base and serve double duty as shipping carts (which costs less than \$1.75 per square per foot), etc. The only requirement is that the carrier must be designed to be easily picked up by the hooks on the pick and place unit. As an example, palletized benches can serve as carriers if the extrusions are designed to allow pickup by an overhead crane.

Transferring. The fourth element

of any system is the means by which the plant material is transferred from the transport into the headhouse or shipping area. In a totally automated system, this is done robotically.



The X component, or the transport car, can be modified in numerous ways to fit existing greenhouses.

However, it can be done easily by more traditional means. This article is intended to concentrate on operations in the greenhouse itself, so I will not go into detail.

GETTING COMFORTABLE

Systems such as the new XYs can seem very complicated. In fact, they are complicated because a

greenhouse growing operation itself is complicated. The new 17-acre XY we've been talking about in the past two columns took two years from concept to startup.

It is impossible to overestimate the need for planning when considering automation. Much more time should be spent on planning than on implementation. As I have discussed in many of these articles, every operation in a greenhouse is related to all other operations. Each individual operation, when looked at in isolation, may not seem complicated, but when viewed together, the integration of these operations presents a formidable challenge. This challenge, however, is not insurmountable and can be met by a methodical planning process. The result of this planning will be a truly integrated system that will provide the grower and the consumer the lowest cost and highest quality plant material. GPN

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