Improving Productivity and Morale Through Mechanization©

Mark Rainey
Hines Nursery, Inc., P.O. Box 42284, Houston, Texas 77242

INTRODUCTION

All businesses have one goal in common — to increase their output and profitability, while reducing costs. The results would be to make more money. So what do we do every year? We ask our employees to be more productive, work smarter, not harder, and so on. At some point there is no room to improve the same processes. Employees are working as smart and productively as they can with the tools they have been given. What do you do next?

This past year we have taken the next step. We have changed our processes of making cuttings with the implementation of mechanization.

BACKGROUND

At Hines Nursery-Houston we will direct stick 21,000,000 cuttings in a year. We stick those cuttings in 6-cm ($2^1/_4$-inch) 8.5-cm (3.3-inch), and 950-ml (1-qt) pots. Our propagation rooting area covers $9^1/_2$ acres. Weather conditions in Houston are shown in Table 1. Total employees in propagation: 77 during day and eight on night shift.

Table 1. Weather conditions in Houston.

Fiscal quarter	Average daily high temperature C° (F°)	Average relative humidity (%)	Average maximum daily rainfall mm (inch)	Days per quarter with rain
1st	19 (67)	86	76 (3)	27
2nd	29 (84)	89	114 (4.5)	24
3rd	33 (92)	90	102 (4)	27
4th	23 (73)	88	102 (4)	25

OLD PROCESSES

The old propagation processes were set up into three teams. One team filled flats and set up pots, while the other two prepared cuttings. The flat filling team would set flats with pots in them onto a flatbed trailer. One line on the trailer holds 50 flats. A New Holland skid loader is then used to fill the line of flats with soil. After one line is filled, another line is set up and so forth until there are five lines of filled flats. When the trailer was full, the team pulled the trailer to the outside of the sticking area to be used and left the trailer. The team preparing the cuttings would work up the cuttings inside the propagation building and every 2 h they walked them out to the rooting area and stuck the cuttings into the flats. They then carried the flats into the mist area and set them down. When all the cuttings were stuck, the team walked back to the propagation building.

REASONS WHY THE PROCESSES NEED IMPROVEMENT

- The walking time to and from sticking area was consuming valuable production time. The distance each employee walked varied each day depending on the sticking location, but on average each person daily walked 20 to 30 min depending on the person. The average size of the team was 20 people, which equaled 6.6 to 10 h walked per day. This average 33 to 50 h of walking per week per team.
- Cutting productivity has been stagnant for several years. Our cutting rate is 400 cuttings per h per person.
- We needed a greater focus on quality. The team leader had to split her time between the inside of the propagation building and the sticking location, which made quality control more difficult.
- We needed to improve the quality of work life. With all sticking being done in the mist area, the employees had to deal with all weather conditions. In the summer employees were uncomfortably hot in summer, cold in winter, and when it rained they got soaked.

NEW PROCESSES

All cuttings are prepared inside. Flats are filled on a flat filler that feeds onto a 16-station, 2-tier sticking line. All work is done inside away from the elements, thus improving the quality of work life immensely.

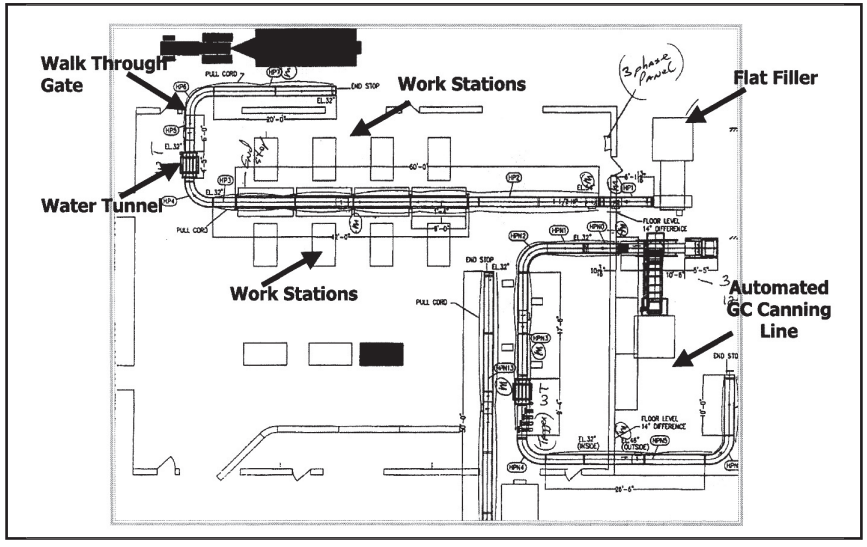

Figure 1. Systems overview.

HOW IT WORKS

The system starts with a B & L Maxi Flat Filler. The flats are filled and are fed onto an incline conveyor that moves the flats into the propagation building onto the top tier of the two tier sticking line. The top tier runs 27 m (90 ft) into the propagation building above the lower tier. On the top tier there are a series of sensors that stop the flats at each workstation, so as the worker removes the flat to stick cuttings,

another flat moves into the empty space. After the worker sticks the cuttings she can then slide the flat onto the lower tier conveyor. The flat then moves down the conveyor through a water tunnel and out of the propagation building. It stops to be loaded onto a trailer. The trailer is driven to the greenhouse and the flats are set down in the mist. (Fig. 1)

HOW TO PAY FOR THE SYSTEM

The first step is to collect the information needed to justify the expense.

- Labor hours spent by team
- Cuttings prepared and stuck each month
- Container size used most
- Average cuttings prepared per hour

We also visited and talked to other growers that were using similar systems (Green Circle, Hines Fallbrook, Hines, Oregon). After talking to the other growers, Hines, Houston, felt that we could at least achieve a 5% increase in efficiency. Using the 5% efficiency number and the 69,936 hours used in a year, we would see a savings of 3496 h times an hourly wage of $9.56. The savings on hour reduction would be $33,421 in 1 year.

Table 2. Cost of equipment, cost of installation, and payback period.

Cost of equipment:	
Conveyor from flat filler	$1569
Incline conveyor (9.5 ft)	$1561
16-station, 2-tier sticking line	$14,219
Visser water tunnel	$3790
Conveyor (2 – 90 ft and 2 – 10 ft)	$5729
Emergency stop system	$864
Shipping fees	$1200
SUBTOTAL	$28,932
Cost of installation:	
Electrical	$10,000
Modify propagation building	$3650
Labor	$2868
SUBTOTAL	$16,518
GRAND TOTAL COST	$45,450
PAYBACK (YEARS)	1.4

With the short payback period it is easy to make the decision to proceed with the new mechanization (Table 2). We are opting to tag onto an operating lease that is in the works for some other equipment around the company. The lease is a 60-month operating lease with G.E. Capital.

CHALLENGES/PROBLEMS

- All the equipment did not arrive on time. The original installation date was set for November 2002; the last of the equipment arrived March 2003.
- Because of the late arrival in the beginning of spring, it was hard to set aside the labor to do the installation.
- The top tier sensors would not work. We had to modify the brackets on the conveyor and move the sensors closer to the flats.
- Old working stations were too big. New tables are being designed.
- Run off from water tunnel. We had to reroute drains.

AREAS WHERE SAVINGS WERE REALIZED

- With the new processes we now utilize just one team leader, rather than three.
- Eliminated all walking time with an annual savings of 1760 to 2600 h (44 to 65, 40-h weeks per year).
- Productivity has seen an immediate increase from 400 cuttings per hour per person to 472 — an 18% increase.
- Materials savings: (1) We now have a central area where we apply hormone that has limited the amount of waste. Estimated savings this year was $2000. (2) The team leader has better control of glove use with an estimated annual savings of $300.
- Quality: team leader no longer has to split her time between two areas (cutting preparation and sticking areas). The team is all together in one area so the team leader can focus on checking the quality of each person. We have had a 4% increase in our rooting percentage compared to last year, we now have 800,000 more live plants in production.

Automation is no longer just for the large European operations; automated equipment is becoming increasingly more affordable and applicable for growers of all sizes. Cutting edge technology is here and being used in the United States of America. We need to look at this technology and implement it into our operations.

AVAILABLE TECHNOLOGY

- Vision grading for sorting young plants
- Pot filling machines for large containers
- Transplanters and cutting sticking machines
- Needle seeders that can sow 300 trays per hour
- Tagging machines to eliminate tedious labor
- Water tunnels to water trays as they pass down the line
- Automated irrigation booms
- Robots that load and unload plants
- Fork lifts that move pots or flats