From hands and feet to robots and spreadsheets©

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INTRODUCTION

It is said "necessity is the mother of all invention," and for our company this is very true. Although we didn't invent anything, certain economic situations made it necessary for us to reinvent our production methods. The economic slowdown that started in late 2008 and dragged out for many years set a new course for Decker's Nursery that we are still traveling. This is the journey we took to mechanize our company.

To better understand the journey, it will help to understand our company. Decker's Nursery was founded in 1921 by Paul Offenberg. He was a professionally trained Horticulturalist from Holland who immigrated here and used his skills to start Paul Offenburg Nursery. Through hard work and a lot of effort, the nursery grew, relocated a couple of times and reorganized into the company that is Decker's Nursery today. The Nursery focuses on propagation and wholesale nursery production.

Decker's Nursery can be broken down into three main departments: container, liner, and field production. The field department produces B&B trees and evergreens on around 90 acres for a very local customer base. The liner department is a national supplier of 4- and 2.5-in. pots and ships to 36 states and Canada. The container department is a regional supplier growing on 26 acres. We grow mainly #1, #3, and #7 for local independent garden centers and landscapers. We carry around 200,000 #1, 225,000 #3, and 15,000 #7 in production and sales for a complete year.

The economic slowdown affected every department in very different ways. The field department went from growing on over 100 acres to growing on less than 60 acres. The liner department actually maintained sales through the slow down by partnering with different introduction companies. The container department lost about one third of its sales. As a whole we dropped around 29% in overall sales.

As a cost saving measure we cut labor … and cut labor … and cut labor. We went from 58,000 work hours at the peak of our pre-recession sales to 29,000 work hours at the bottom of our sales during the recession. We lost one third of our sales and half our labor from 2007-2011. In 2011, we decided we were not going to be able to save ourselves into prosperity. We needed to increase sales and increase production. The general lack of available labor made it impossible to go back to pre-recession practices so we needed to rethink everything.

REDUCING AND MAINTAINING LOW LABOR COSTS

Reducing and maintaining low labor costs while increasing plant quantity and quality was the foundation for all our decisions. In the spring of 2011 we invested a lot in updating equipment and new production techniques in the nursery. We bought a flat filler, an EZ trimmer, and conveyors for the liner department. The container department got a shape trimming machine and a set of pot forks … and so the journey begins.

When we got the pot forks we didn't quite understand what we were setting ourselves up for. The first major problem we ran into was our pots. The pots we were using originally didn't work with the forks. There was a misunderstanding when we bought the forks, and we quickly realized our blow-molded pots would not work. We needed to change all our pots over to a different style, one that had a hard rim around the top for the fork to catch. The problem was exaggerated because of the recession. We had thrown away tens of thousands of plants over 2 years saving all of the pots. We saved so many pots; we didn't buy any 3-gal containers for almost 2 years.

After we got the correct pots and could use the forks to pick them up, things really

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started to move forward quickly. The next problem we had was keeping the pots in rows on the trailers. We use a 4×12 ft tracking wagon made by Mitchell Ellis Equipment to move pots around the nursery. The problem was the pots would shift around after the wagons were moved. This made it impossible to slide the forks back in between the pots and pick them up.

We did try a couple of different theories but ended up building a grid system to set into the trailer. Using some old metal tree stakes (we weren't using because our field production down sized) we created a grid pattern 4×12 pots for #3 that we would set the pots into and they would hold in place even after the wagons have moved around. Little did we realize that we created the pattern to which most of the nursery has been or will be altered to match.

We had the pot forks, the correct pots, and the wagons to move them around. Now we needed the correct equipment to use the pot forks. We owned a New Holland and Bobcat skid steers so we tried both of those with no luck. We rented fork lift that didn't work. The problem was the four wheel design. It would leave ruts in the gravel areas when the operator would turn in tight places. So we made another investment in a Trike forklift.

The Trike forklift has many features that make it successful with the forks. Its open design allows for unobstructed view for the operator. The quad front wheels act as a roller and smoothes out gravel. The three wheel design gives it a zero turn radius without leaving ruts behind and the hydrostatic transmission allows for smooth starts and stops. The Trike forklift was made to work with the pot forks and it really does.

The next few steps we took were more about increasing the efficacy and versatility of the Trike forklift in our nursery. During the beginning of the economic downturn we quickly realized we had more over wintering storage capacity than we had summer time growing space. Until we decided to mechanize it never really mattered. But once we saw the future, we knew we needed to have as much open space that we could get. This would allow for Trike forklifts, trimming machines, and robots to move freely around. So, early in the process we made efforts to cut down as many houses as we could. We also have started a practice of overwintering many items outside to further decrease the need for houses even more.

Along with having unobstructed spaces we wanted the ability to move freely across those spaces; which can cause some real problems with most irrigation systems. Working with Netafim we implemented a completely new irrigation system in the nursery using Oval Tube and Meganet™ irrigation nozzles. Oval tube acts much like a larger fire hose that inflates when in use and flattens when it is empty. The tube is light weight, easy to install, and is highly versatile. With oval tube, we can drive our wagons, trimming machines and Trike forklifts around the open with no physical obstructions.

So we have the pots, we have the forks, we have the wagons with grates, we have the Trike forklift, and we have increased open spaces and now we were ready for the largest step of all … robots. For a couple of years, we realized this was the ultimate goal. After Brian Decker saw a demonstration at Willoway Nursery we envisioned this being implemented and working with all the other systems to really maximize our nursery production. All of the steps we made toward mechanization, we made with this final step in mind.

This spring we leased four robots from Harvest Automation for 3 months as a trial. They actually sent five to make sure we had at least four that would work for us. We received them in late February and started to play around with them inside before spring started. The robots work on a two-wheel system with a large roller acting as a very high tech three wheeler. Two paddles in the front act as gripper that open and close to pick up the pots. Five different electronic eyes help guide and read distances to pick up or set down the pots. There is a reflective tape that is used to act as home base for the robots to read distance and directional orientation.

There is wide range of programing options: pot size, spacing distance, spacing patters, etc. Harvest Automation also gave us a spread sheet to help understand our spaced block size, our un-spaced block size and the frontier. The frontier is the distance the robot travels to pick a pot up and set the pot down. Managing the frontier is very important to maximizing the efficiency of the robots. If the frontier is to short, the robot spends too much time pick up and setting down plants. If the frontier is too long, the robot spends too much time driving.

Early in the spring we laid out long runs of un-spaced pots in our three bay wide

system for the robots to come back in later to space. Ideally, a company would have four or more robots working with one operator. The operator is there to watch the robots and fix any issues that might happen. Certain actions can cause a fault in the robot which needs to be reset by pulling the magnetic flag on its back. If your frontier is too close or too far, if it is too close to another robot, if it bounces up and the electric eye loses the reflective tape it will cause faults that would need to be reset.

Once a week you download the data from each robot and send it to Harvest Automation and they send it back to you as spreadsheets. The one thing I can't stress enough about Harvest Automation's is their commitment to customer service. The amount of information you get from the spread sheets is amazing. Things as simple as number of pots moved in one hour, day, or week to average frontier and faults. They also work with you to help you understand the data and how the use the data to improve efficiency.

The robots are a great display of where our industry is heading, but it's not the place Decker's Nursery is at currently. We decided at the end of our lease to return the robots and invest in other structural and mechanical improvements. There were many reasons we made the decision we did but I'm sure this is a decision we will have to revisit in the future.

TO REVIEW

- We changed our pots and limited new pots to only "wide rim" style.
- We modified our wagons to hold the pots.
- We invested in two Trikes.
- We have bought or made multiple sets of pot forks for #1, #3, and #7 containers.
- We improved our irrigation and fertilization methods to increase efficiencies with our new systems.
- We trialed robots but decided against them.
- We look forward to improve all structures to be Trike compatible.

In conclusion, our ultimate goal was met. We were able to cut labor cost and increase our sales. In 2014 our sales were up by 15% over the pre-recession high of 2007 but our labor hours were down 43% from the same time (Figure 1). Our journey through this process had many twists and turns, but was successful and is far from over.

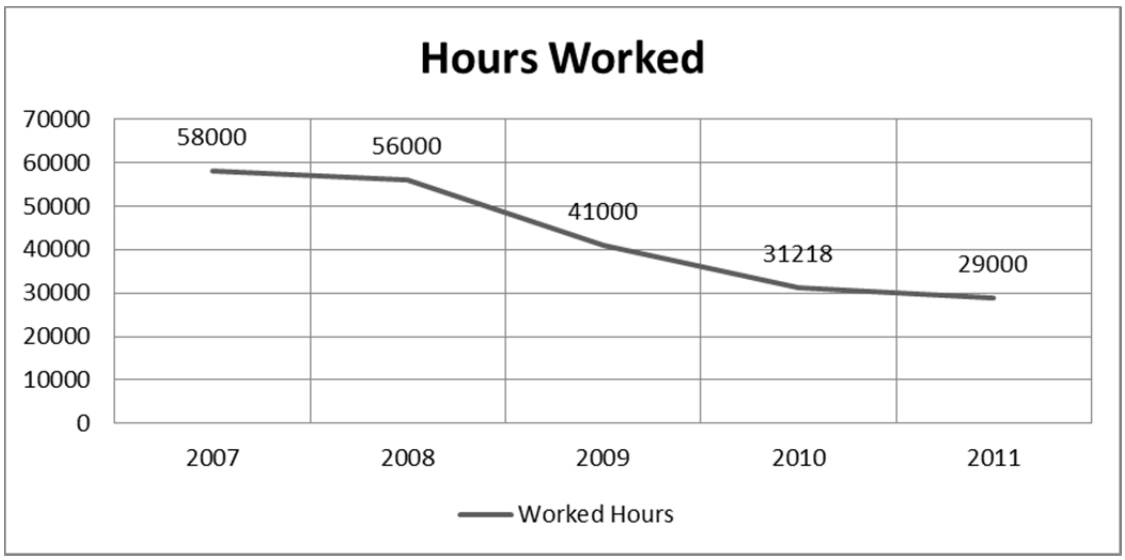

Figure 1. Labor hours from 2007 to 2011.