

Problem Statement and Goals

The Nursery Project

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Table 1: Revision History

| Date | Developer(s) | Change |
|------------|---|---|
| 2022-09-25 | Juan Moncada, Aaron Billones, Steven Ramundi, Gillian Ford | Initial release |
| 2023-04-05 | Juan Moncada, | Updated to better reflect final product |

1 Problem Statement

Sheridan Nurseries is one of Canadas largest nursery opperations and is growing year by year. In the past few years, the company has taken steps to automate their production line and streamline their operation. A significant amount of manual labour was seen in between the delivery of skidded pots/trays and the beginning of the propagation assembly line. In the current state, one employee is used to recieve stacks of pots and trays from their respective skids, populate the trays with pots, and feed the now filled trays into the assembly line where the propagation of plants into the pots begins. This process currently requires full-time labour from at minimum one employee, if not more, to yield the required output.

1.1 Problem

Sheridan Nurseries currently has no automation in their process of populating their trays and pots thus needing significant manual labour.

1.2 Inputs and Outputs

1.2.1 Physical Input

Physical inputs will be stacks of trays and pots.

1.2.2 Software Input

The system will have a signal trigger to indicate if there are any trays and pots in order to carry out its operation. There will also be an on/off signal and safety kill switch.

1.2.3 Physical Output

The physical output of this project will be the trays filled with pots ready to move on to propagation.

1.2.4 Software Output

The systems will display a series of warnings such as load trays (when empty), load pots (when empty), and verification failed.

1.3 Stakeholders

The main stakeholders for this project will be the nursery manager, owner, and the individual(s) working the assembly line.

1.4 Environment

This project will be an even split between hardware and software as there is a need to build and incorporate into an existing assembly line. Hardware will have to be used in order to manipulate pots and trays, while software will be used to control said hardware as well as take care of any verification that trays have been populated properly.

2 Goals

The main goal of this project is to develop a system for Sheridan Nurseries that will replace the need for human workers in the current process of populating plant trays with pots. This will reduce the cost of labour for the nursery, while being significantly less expensive than current alternatives. The goal of the system is to populate a standard tray with 1 pot in 30 seconds, equating to 2 trays per minute and 960 trays in an 8 hour shift. This is based on output numbers provided by the manager for the current system. Another goal for the project is to reload the trays and pots every 7.5 minutes. This would require space for 15 trays and 150 pots.

3 Stretch Goals

The first stretch goal is to double the potential output of the machine. This will approximately equate the output rate to maximum rate of the machine responsible for populating pots with soil. The second stretch goal is to increase machine capacity to 60 trays and 600 pots to maintain the goal of reloading the machine every 15 minutes. The third stretch goal is to make the machine capable of dealing with variable tray and pot sizes.