Tech Expo, Fall 2025 – Team 18

SMART Manufacturing Lab

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PURDUE UNIVERSITY
Polytechnic Institute

Problem Statement

The Purdue SMART Manufacturing Lab has identified inefficiencies in its production processes, data integration, and supply chain management. The lab's current manufacturing system is not fully optimized, limiting its ability to meet the goal of producing 12 skateboards per hour. Issues related to hardware and software integration have been noted, preventing seamless data collection and real-time analytics, which are essential for process optimization. Additionally, bottlenecks in material handling, warehousing, and workflow efficiency have been detected, creating disruptions in production flow and increasing operational costs.

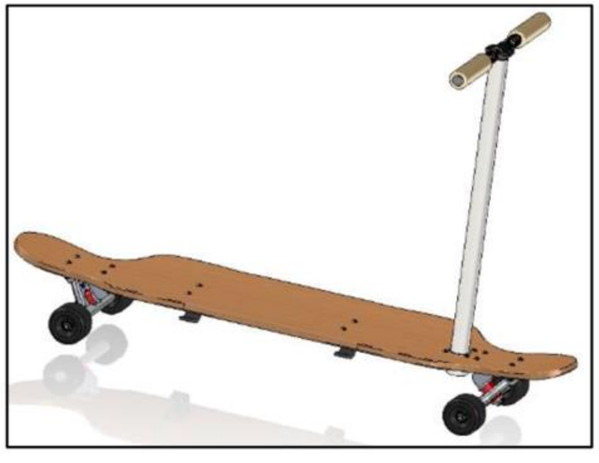
Customer Background

Purdue University is making strides to develop a semi-autonomous lab that works as an assembly line. The “Smart Machine & Assistive Technology” lab, also known as the SMART lab, is one of Purdue’s solution to this. The SMART lab we were working in develops a product called the Scoot-n-Skate which is a skateboard and a scooter.

Requirements

1. 12 Skateboard Per Hour
- Reduced cycle time of bottleneck stations
- LightGuide improvement
- Reduced station scrap
- Ergonomic improvements
- New station routes

2. Supply Chain Adaptation
- Implementation of ASRS / AMR’s
- Creation of part #’s



Experimentation and Concepts

Experimentation
- Running the line ourselves
- Alternation between station 3020 & Auto-Cell
- Changing LightGuide threshold values with steps & within bin orientation

Concepts
- 5S (Sort, Set, Shine, Standardize, & Sustain)
- Cycle Times
- Line Balancing
- Continuous Improvement

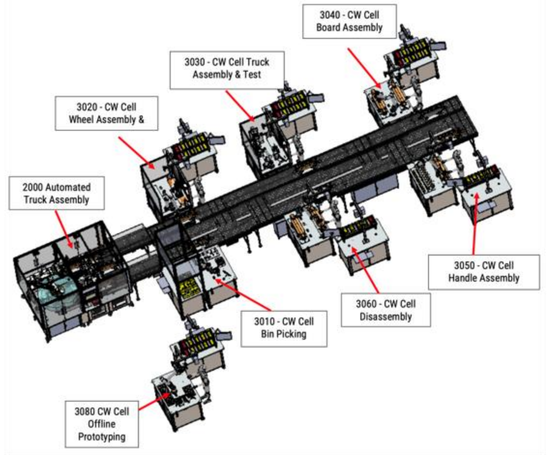
Final Design

Continuous Improvements to Workstations
- Bin labels
- Bin placement closer to station based on steps in process
- LightGuide tolerances changed

Part naming conventions
- Strategies for new product implementation (eg. SB vs GP)

Supply Chain Resilience
- Part storage in bins (bin-kitting)
- Replenishment routes and timing

Testing and Results



Our testing process involved us making changes to stations and then running the line to see if it improved the line at all. We found that our work on the LightGuide, changes to station setups, and the implementation of a switch use of the Auto Cell decreased our line run time the most.

At the beginning of the year the SMART lab assembly line was producing 0 Scoot-n-Skates per hour. After our team’s improvements over the past year, we are currently at 10 Scoot-n-Skates per hour.

Additionally, on the non-quantitative side of results, our improvements led to the stations being more user friendly. The added visual cues to each station provides ease of use for operators of any experience level.

Path Forward

Our team has made great progress over the last year, but there were things we started and were unable to finish. We hope the next group will be able to finish what we started. Some areas of focus are as follows

- Focus on the auto cell
- Implementation of the AMR routes
- Stocking and using the ASRS