



Wiscraft Briggs and Stratton Shroud Label Application Device

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Abstract

Last semester our goal was to design and fabricate a device that allowed a completely blind employee to accurately apply stickers to an engine shroud. As of Sept. 2010 the process did not allow completely blind employees to achieve an acceptable success rate (32%). To improve the process, the team designed a push down system that applies the stickers in a precise location. Through testing the new device proved to be significantly more accurate (100%) and faster as well.

While satisfied with the result, the team found components that could be improved to upgrade the ergonomic viability and further increase the efficiency. Due to a delay in fabrication, testing of the final product has not been conducted. An advanced prototype showed similar trends to those results found in Dec. 2010.

Introduction

Wiscraft is a non-profit company that provides employment for vision impaired adults. 75-90% of Wiscraft employees are legally blind and working on 10 different production lines. During the Fall semester, the team designed a prototype to make the Briggs and Stratton sticker shroud line more efficient. Prior to our design, the process could not be completed by completely blind employees, as 68% of their finished parts required rework.



Figure 1- 1. Old Method (Sep 2010) 2. Pedestals for stickers. 3. Valve system. 4. Spring and template shroud.

The team designed a prototype that utilized a pedestal system that allowed stickers to be placed with the adhesive side up; allowing the user to readjust the sticker's position prior to permanent attachment. Each pedestal had an air channel that allowed a vacuum to pull the sticker off the user's finger. Individual valves were used to isolate the vacuum to each pedestal. The user then placed the shroud inside the template shroud and pressed down, applying all three stickers to the shroud.

Analysis of Prototype

- Accuracy: 32% (Sept. 2010) → 100% (Dec. 2010)
- Rate: 12 per hour (Sept 2010) → 23.5 (Dec 2010)
- Eliminate valves and tubes
 - Stronger vacuum to support 4 devices
 - Internal channel system
- Tilt device up toward the user
- Incorporate turntable for other shrouds

Design Criteria

- Accuracy: Maintain ~100% success rate
- Efficiency: Increase to 30 shrouds per hour
- Improve Ergonomics
- Allow different type of shroud
- Maintain compliance with all fall semester specifications.

Final Design

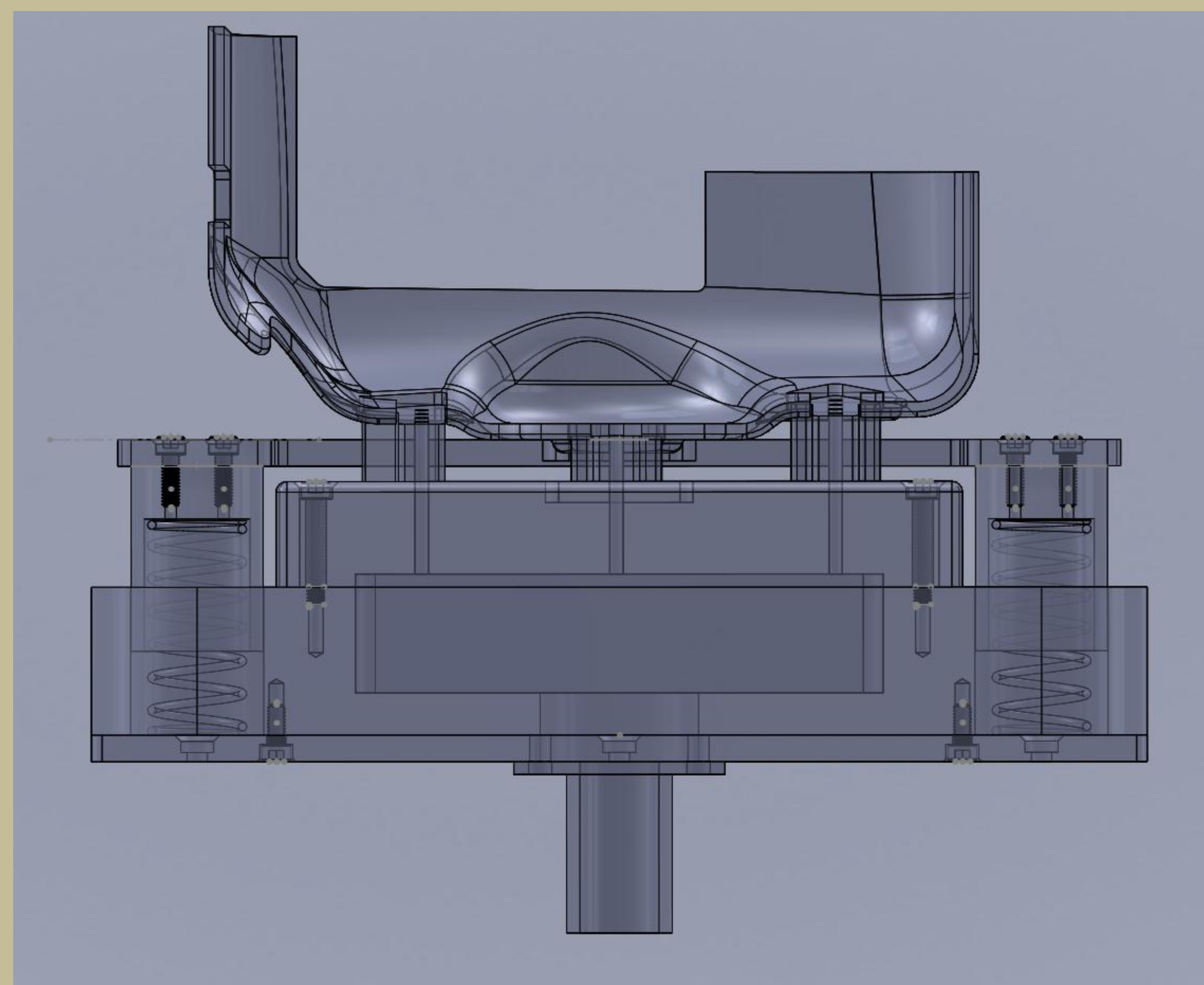


Figure 2- Manifold system.

The device is constructed in a series of machined aluminum components. Adjacent pieces are held together by screws and sealed with a rubber gasket to ensure the vacuum throughout the device is maintained. This creates an internal channel system eliminating the need for valves. Building the device from aluminum provides durability and multiple pieces allows Wiscraft to replace one component rather than rebuilding an entire device.

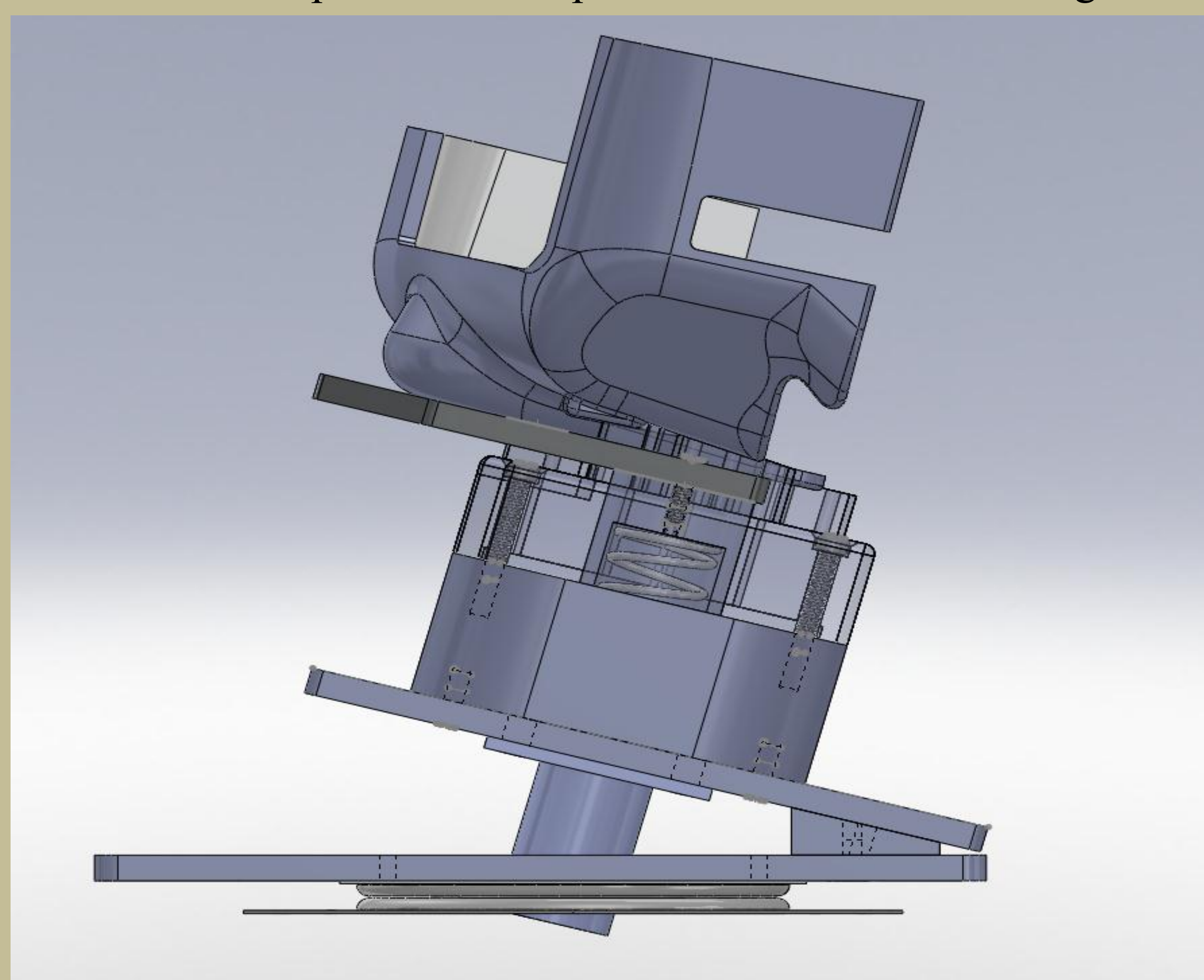


Figure 3 – Ergonomics and Additional Improvements

The entire device was raised to a 15° angle to move in plane of the worker. The springs were previously mounted at the front of the template shroud, where a large moment was created when pushed. The columns in the new design have been shifted toward the middle to better support the center of mass and allow strictly vertical displacement. A turn table has been added to allow for placement of side labels on 5-label shrouds.

Business Justification

- Line ran for 11 months: 50,963 pieces → 4,633 shrouds per month
- Sticker scrap cost: \$0.34 per sticker
- Inspection and Remove Labor: \$0.75 per shroud
- Rework: \$0.25 (labor)
- Total Cost for reworking 1 bad sticker = \$1.34
- Old Method:
 - 32% accuracy
 - Required 100% inspection
 - \$4,221 in scrap per month
- New System:
 - 100% accuracy
 - Cost of fabrication and materials: \$9,186
- The amount of savings in eliminating scrap will overcome the cost of this design in **2.18 months**
- **1,589** hours saved for next order for completely blind employees
- Yearly Savings
 - Savings = (Scrap \$)*(12 months) - (Cost of new System)
 - (\$5,292)*(12 months) - (\$9,186) = **\$41,466**

Testing

Test	September 2010	December 2010	April 2011
Accuracy	32%	100%	100%
Parts Per Hour	12	22.5	19.83
Time	4.75 min	2.51 min	3.03 min

Table 1- Testing Results. Results were taken conducting the sticker application process for the existing device (Sept. 2010), our first prototype (Dec. 2010), and a modified version of the prototype (Apr. 2011).

Future Work

- Fabricate sticker applicator → Wiscraft
- Install device at factory
- Train employees to new process
- Test functionality
 - Continue line studies throughout production (parts per hour, accuracy, etc.)
- Re-evaluate design if necessary

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