Wiscraft Briggs and Stratton Shroud Sticker Application Device

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Abstract

The goal of this semester was to improve the productivity and ease of Wiscraft's assembly lines by evaluating their current system and providing suggestions as well as hardware prototypes. As the semester progressed our goal was refined to designing and fabricating a device that would allow a completely blind employee to easily and accurately apply stickers to an engine shroud. Currently, the existing method doesn't allow completely blind employees to achieve an acceptable success rate. To improve the process, we designed and fabricated a push down system that applies the stickers in a precise location. By incorporating Wiscraft's current shroud mold and a vacuum system, the user must only lay stickers into their designated cavities (sticky-side up) and push a guided shroud into the stickers. The final design not only increases productivity, but also allows for a wider range of Wiscraft's employees to operate the line. Future work entails refining the design to increase speed and productivity for all users, effectively eliminating the need or use of the old method.

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 and in a machine shop. The company makes small assemblages for private companies, such as: Briggs and Stratton, Harley Davidson, and Pentair, and products for the government. Our role in this project is to serve as a consultants along with an ISYE student team, to help make Wiscraft's production lines more efficient.

Our team focused on the Briggs and Stratton sticker shroud line. During this process a template is placed over the engine shroud, and the employee places a sticker in the designated slots. Currently this process can not be completed by employees that are entirely blind, as 4 out of 10 parts require rework. The goal of this project is to update the tools and hardware used in this process so that all Wiscraft employees can work on this line and produce product accurately and efficiently.

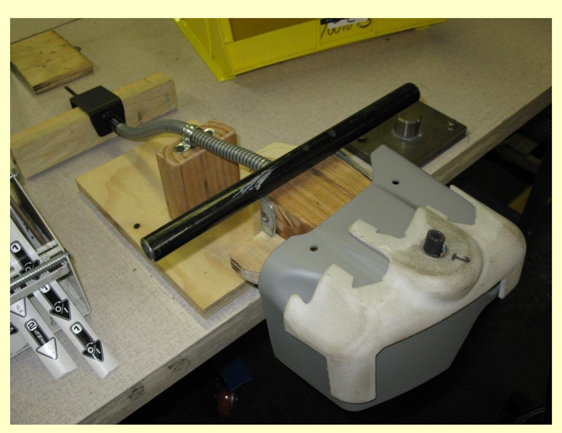

Figure 1 (left)- Current Method. The engine shroud (dark grey) is mounted on a fixture with the template (white) placed on top. The employee then places three stickers (seen on far left) in the slots cut into the template. The stickers need to be accurately placed and without wrinkles or bubbles

Design Criteria

-Accuracy: Over 90% success rate
-No wrinkles or bubbles
-Ergonomic: Accessible for completely blind employees
-Durable: Up to 500 uses per day
-Size: no bigger than 1 cubic foot
-Weight: Under 10 lbs
-Safety: No hazards during operation

Final Design

Overall Concept- Our design utilizes a pedestal system that allows stickers to be placed with the adhesive side up. By placing the stickers in this orientation, the user can adjust the sticker prior to permanent attachment. By changing the sticker and orientation and utilizing the following components our design increases the output accuracy for completely blind workers.

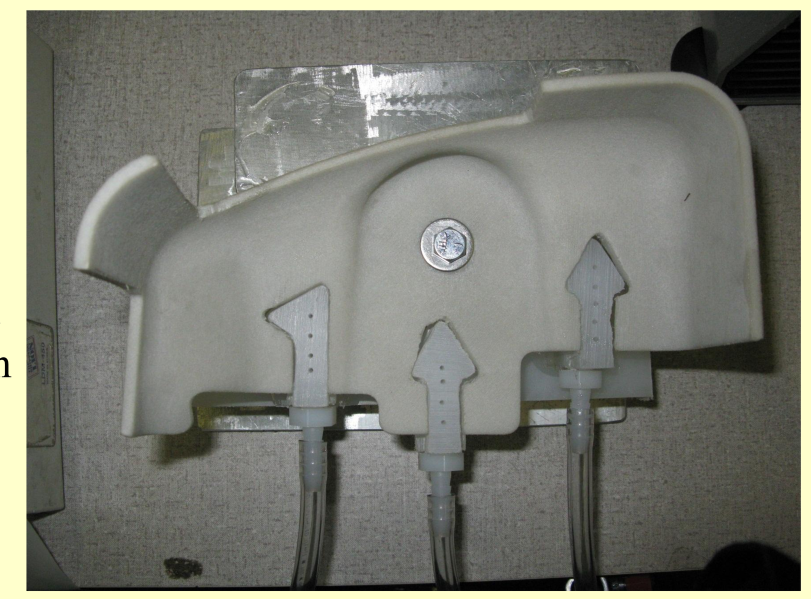

Figure 2 (right)- Pedestals. The stickers lay "sticky" side up on each pedestal. There are multiple holes on the top of each pedestal which allow a vacuum pull. This vacuum pulls the sticker off of the user's finger. The walls of template shroud surround each pedestal, which limits translation for each sticker after placement.

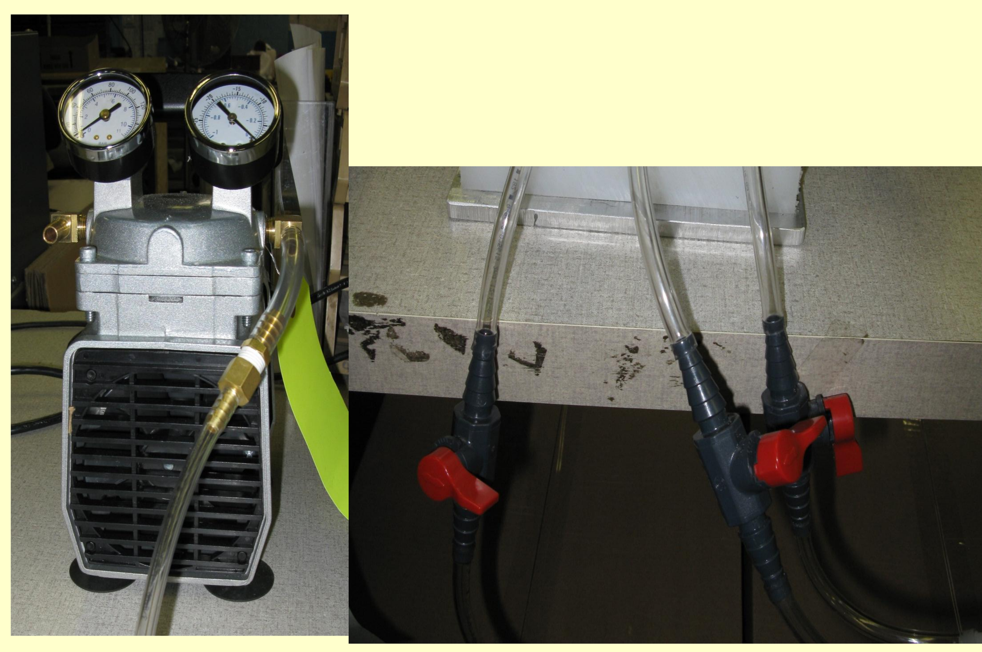

Figure 3 (left)- Vacuum and Valves. The arrow pedestals are connected via polyethylene tubing to a vacuum pump. The vacuum can create up to a 25 mmHg vacuum pull. To utilize the full vacuum potential for each pedestal, valves are incorporated to isolate the vacuum.

Figure 4 (right)- Base and Frame. All components are mounted to an aluminum base. The template is connected to two compressible columns, each containing a metal spring. This allows the user to press down on the shroud to meet the sticker interface, thereby applying the sticker to the shroud. After application the template returns to its starting height.

Process

1. **Vacuum is isolated to the first pedestal.**
2. **User peels and places sticker, adhesive side up on pedestal.**
3. **Steps 1 and 2 are repeated for the last two pedestals.**
4. **User places the shroud inside the template and presses down, applying even pressure across all three pedestals.**
5. **Shroud is removed and stickers are smoothed over to remove air bubbles from forming.**

Testing

Type of Measurement	Old Method	New Method with Prototype
Shrouds per Hour	12	23.5
Time per Shroud (minutes:seconds)	4:46	2:31
Success Rate	22%	100%

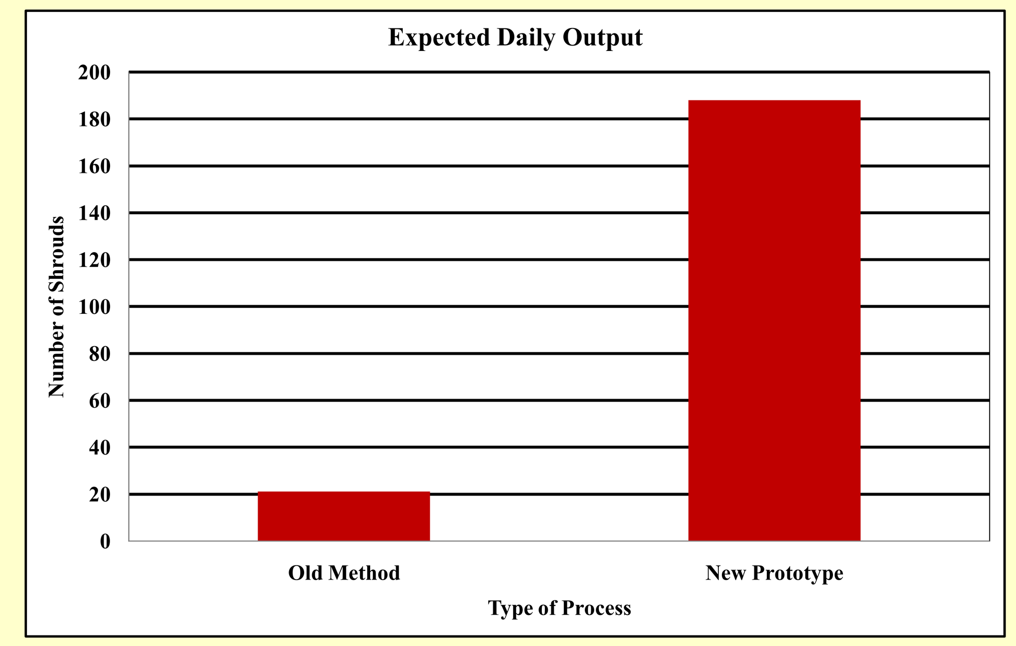

Chart 1- Expected Daily Output. This chart represents the number of shrouds that would be produced daily using the existing method compared to our prototype. These figures were obtained by multiplying hourly average by 8 hours by success rate. Only 21.22 shrouds are predicted daily for the old method, while 188 shrouds are the expected output value for using this prototype.

Ergonomics

-Provided two types of indicators for finding the proper sticker location
~Physical boundaries
~Air flow from vacuum
-Easy to transport
-Keeps work station directly in front of employee
-No sharp edges or corners
-Overall safe to operate

Future Work

-Shift focus toward decreasing process time for all employees
-Improve vacuum system
~eliminate valves
~implement stronger vacuum
-Applicable for both types of engine shrouds
-Meet a goal of 30 shrouds per hour

References

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