# B Walter & Co. Part Stacker

Kyle Condon, Tyler Klima, Dustin Riehl, Crist Troyer
Design Engineering Technology
Advisor: Timothy Jenkins, Ph.D.

## ABSTRACT

B. Walter & Co. is a Wabash-based company that produces functional hardware and custom original equipment manufacturer (OEM) products. The company currently makes a series of L-shaped brackets on a high-speed stamping press (Figures 1 and 2) that requires high involvement by operators to maintain production levels. The challenge lies in the stacking of parts that exit the press and need to be placed in bins for additional processing later. The issue with the process is that it takes two operators to run the machine and that is very inefficient for the company. The objective of the group for the Part Stacker project was to create a mechanism or device that would increase the overall efficiency of the automatic stamping press by stacking parts into tubs in an orderly fashion with little to no operator involvement.

Figure 1: Stamping Press Interior

Figure 2: Current Stacking Setup

## CUSTOMER NEEDS & SPECS

Needs:

- Safety
- Efficiency
- Cost
- Reliability
- Ease of use

Specifications:

- Part stacker must stack 60 parts per minute
- Reduce operator time spent restacking parts by 90%
- Keep cost below $3,000
- Mechanism won't hurt operator
- Mechanism will fit into a 4' x 8' x 4' area
- Mechanism won't damage parts
- The mechanism will be reliable
- The mechanism will stop within 2 sec of the emergency stop button being pressed

## DESIGN CONCEPTS

The team utilized customer needs to develop specifications that all design concepts needed to meet at a minimum. Each team member contributed two design concepts, which were then further narrowed down to four total design concepts using the concept scoring chart shown in Table 1.

Table 1: Concept Scoring Chart, Initial Concepts

| Criteria | X/Y Moving Table | Removable Tub Jig | Guided Cylinder Mech. | Conveyer Belt w/ Slide | Rotating Suction Arm | Stack w/ Conveyer | Wire Hanging System | Part Dumper | Push Bar/Slide Rail Jig | Flip Stacker | Slide Rail |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Efficiency | + | 0 | 0 | 0 | - | + | - | + | + | + | 0 |
| Cost | - | + | 0 | 0 | - | 0 | + | - | - | - | - |
| Safety | 0 | + | + | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reliability | + | + | + | + | 0 | + | 0 | - | + | + | 0 |
| Ease of Operation | + | 0 | - | + | - | + | - | 0 | + | + | 0 |
| Total | 2 | 3 | 1 | 3 | -3 | 3 | -1 | -1 | 2 | 2 | -1 |

Figures 3-6 show the selected concepts developed by the team for consideration by the sponsor. The concepts ranged in estimated cost from $1,000 to $3,500, from making the current process more efficient to fully automated.

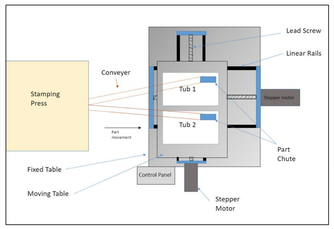


Figure 3: Moving Table Concept

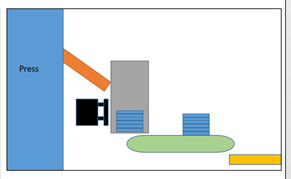


Figure 4: Conveyor Belt Concept

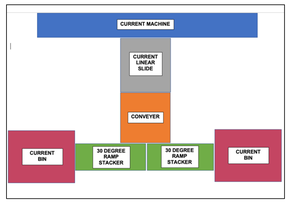


Figure 5: Ramp Stacker Concept

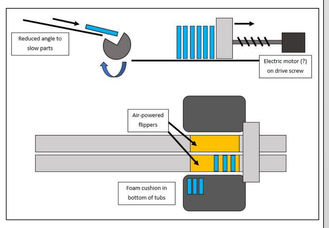


Figure 6: Flip Stacker Concept

## CHUTE DESIGN

The team discussed several options for the chute design and agreed on either a sheet metal chute or a roller-conveyor option. The roller-conveyor design was chosen to expand further as an additional option for the sponsor. Figure 7 shows a representation of this chute.

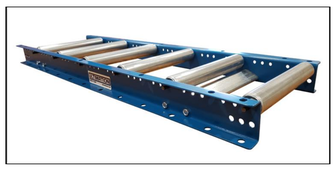

Figure 7: Roller-Conveyor Chute

## TEST RESULTS

The team used an online tool from the 8020 website to calculate deflection in the frame rails, Figure 8. A max load of 400 lbs was applied to a 30" long piece first for the 2" x 4" extrusion and then later for a piece of the 3"x 3" extrusion. The initial test suggested that using the 3" x 3" rails would be OK, and the resulting max deflection was 0.0041 inches downward. This saved the team a couple of inches in overall height needed for the chute design.

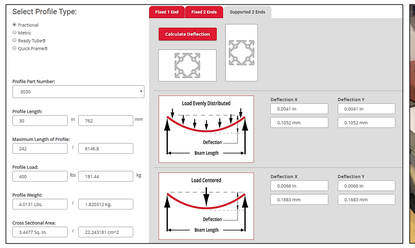


Figure 8: Deflection Calculation Tool

Figure 9: Part Chute Prototype

The group also made a prototype part chute out of foam cut pieces, as seen in Figure 9. This was tested to record how the parts would orient when going through the part chute. Preliminary results were positive.

## FINAL DESIGN

The final design chosen by the sponsor was the moving table concept, shown below in Figures 10 and 11. The concept is comprised of a frame, and linear bearings along with a rack and pinion system to facilitate movement in the X and Y directions. This movement allows for parts to be stacked evenly across the bottom of the part tubs. A removable jig is also used to keep parts stacked within the tubs. This concept is controlled by an Arduino, which indexes the table when a predetermined number of parts fills one of the jig sections. The chute head part is designed to align the parts into the needed orientation.

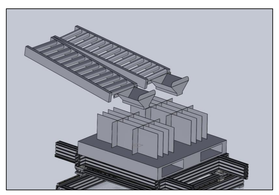

Figure 10: Final Design Assembly

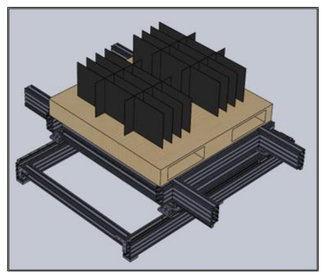

Figure 11: Final Design, Frame & Pallet with Part Dividers

## FUTURE WORK

Due to a global health crisis, the final design was not built to do final testing before Trine went to online-only education. Parts that were ordered will go to the sponsor along with the final documentation. This will enable the sponsor to construct and test the table and determine if additional design work is required. The team is confident the initial final design is sound, but knows testing is required.

## CONCLUSION

Throughout the design process, the group has gone through all the phases required to complete a project. The group researched existing patents, brainstormed ideas, produced concepts, and finally designed and tested a mechanism to meet the needs of B. Walter & Co for the die punch machine. Other key skills gained along the way include better project management skills, part purchasing experience, and an improved ability to speak publicly and within groups. For the project to progress in a timely manner, each group member had to contribute significantly to the project. It was also essential that each group member clearly communicated the tasks each one had completed, so that the group could manage the Gantt chart plan, stay organized, and provide timely feedback to the project sponsor and other stakeholders.

## LESSONS LEARNED

Throughout this project, the team has learned:

- Importance of organization
- How to organize project deadlines using a Gantt Chart
- How to effectively communicate as a group
- How to communicate in a business setting

## ACKNOWLEDGEMENTS

Timerson Downing, Innovation One, Trine University
Joe Thompson, Lab Technician, Trine University
Justin Holley, Engineer, B. Walter & Co.
John Green, B. Walter & Co.

B. Walter & Co.
*Since 1887*