

ABSTRACT

WL Molding of Michigan, LLC, out of Portage Michigan is a large injection molding company. WL Molding mainly focuses on small job shop type orders that cater to the customers' needs. The company came to Trine University for help with an injection molding machine process. A main problem WL molding has is parts are being pushed out of the molds at a very high velocity, this is caused by the injector pins shooting out in a rapid motion. Parts are now bouncing around inside the machine looking for a place to go. At the bottom of the machine there is a funnel in place to catch the parts, However the funnel does not cover the entire area needed to catch 100% of the parts. WL molding sponsored the team to develop a system that would catch 100% of the parts. This new design must meet all specifications put forward by WL molding and additional specifications set by the team. An example of some of the small parts being molded is shown in Figure 1.



Figure 1: Example Products

CUSTOMER NEEDS

- Chute transfers part from molding to collection bin
- Chute will not damage part
- Chute will not drop part
- Parts won't get stuck in chute
- Chute will be durable
- Chute will be a good investment



Figure 2: Contaminated parts

CHUTE EXTENSION PLATES

To address the problem WL Molding was facing the engineering team determined that an adjustable plate setup was necessary. A total of unique plates would be attached to the already existing injection mold chute.

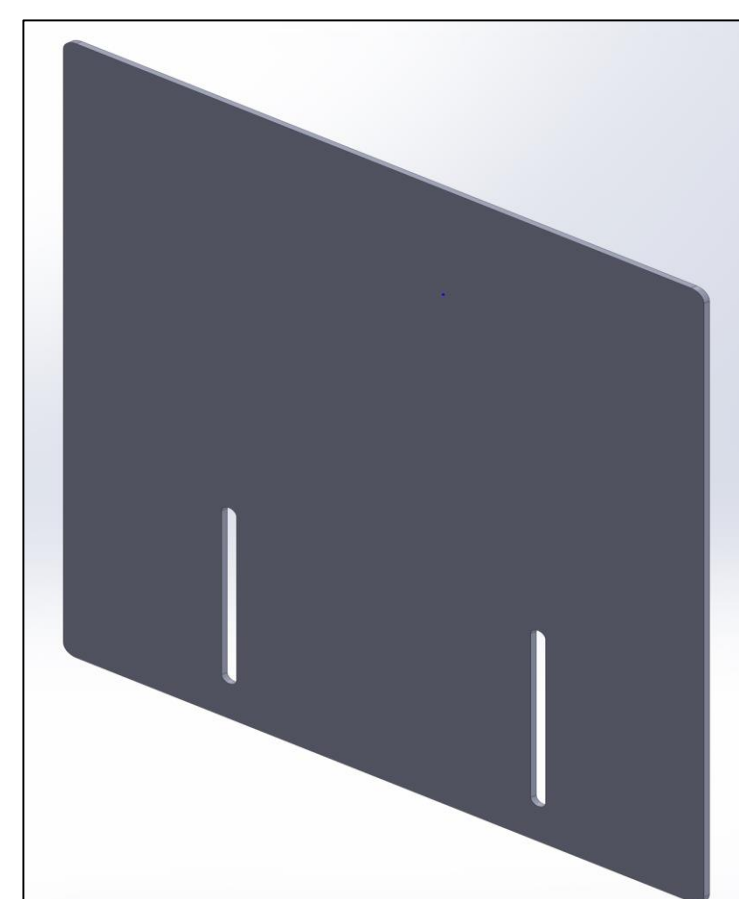


Figure 3:
Adjustable Plate 1

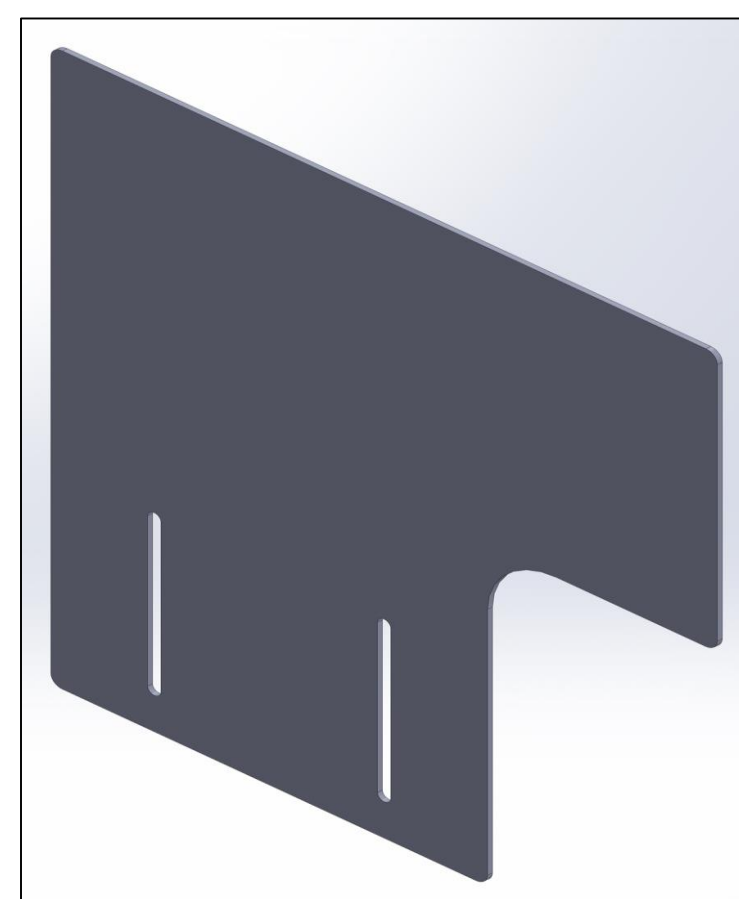


Figure 4:
Adjustable Plate 2

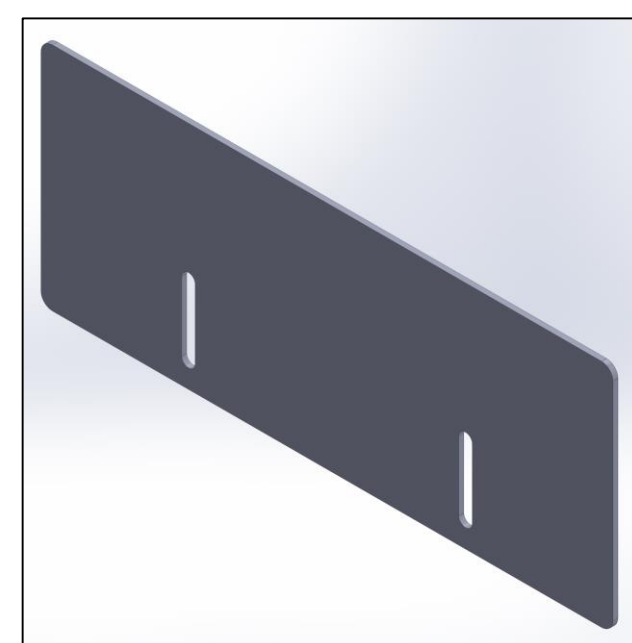


Figure 5:
Adjustable Plate 3

Figures 3-5 show the initial plate designs made by the team. The plate would be made from 318 Stainless that would over very good corrosion resistance, strength and longevity. Slots in the plate would allow for adjustability.

MAC AUTOMATION CURTAINS

The second concept the team developed was found through research and talking to other industry experts. Mac Automation is a company that makes accessory components for injection molding machines. One product is a mold curtain that magnetically attaches to the sides of the mold and aids in part retention. The team had a set of curtains, Figures 6 and 7, quoted and presented these in the final product solution.



Figure 6: Mac Curtain 1



Figure 7: Mac Curtain 2

FINAL DESIGNS

The Final designs the team choose consisted of fabricating the adjustable plates and purchasing the mold curtains. The Extension plates would be attached to the chute Via Rive-nuts, a type of rivet with threads. WL molding stated very early in the project that the teams design would be used for proof of concept and later be replicated. For WL Molding to replicated the final designs the team had to provide full GD&T detailed drawings.

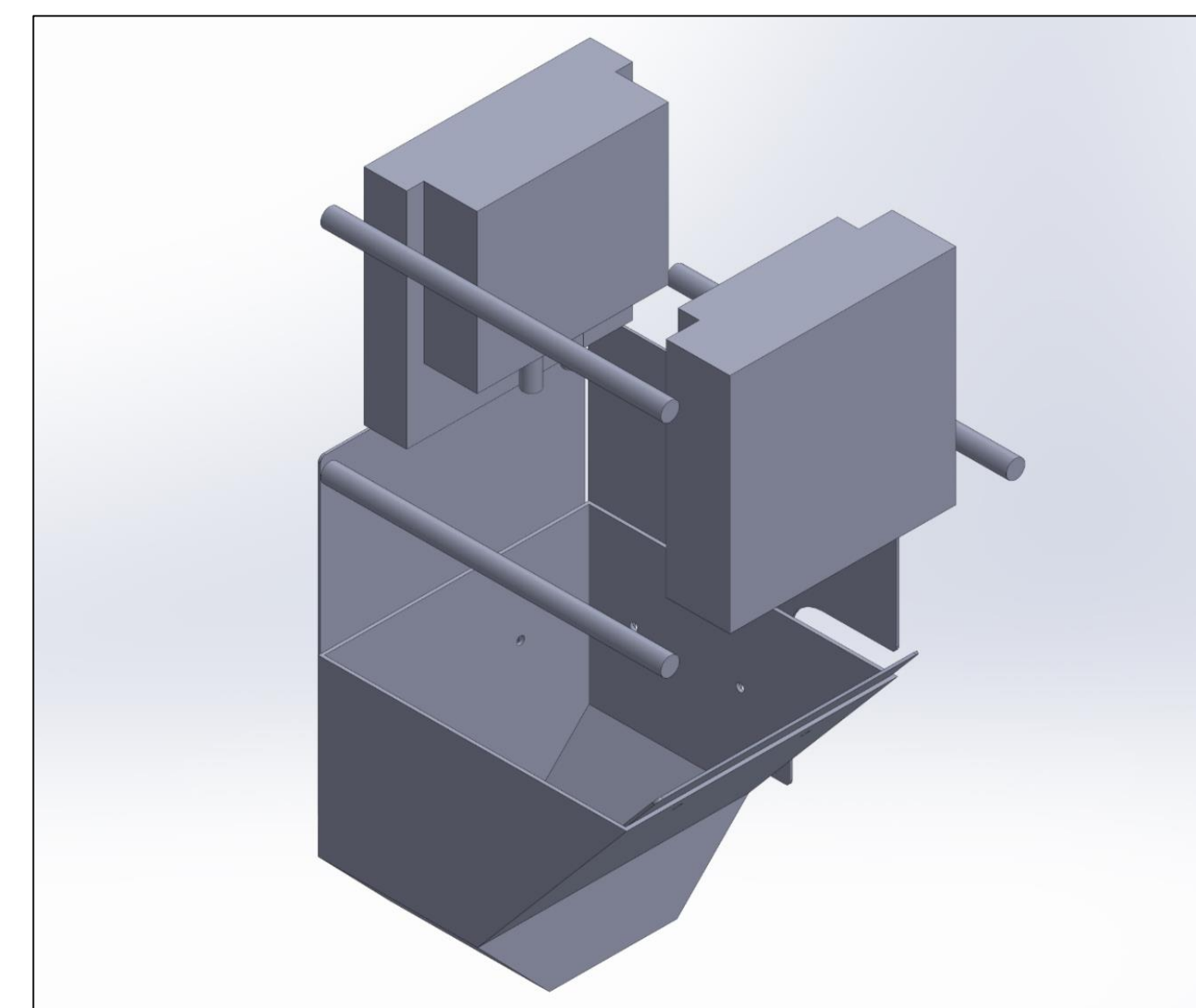


Figure 8: CAD Model

IMPLEMENTATION

The adjustable side plates were installed on an arranged date with WL Molding. This was done so preparations could be made, such as removing the chute, and ensuring the injection molder was not in use. The team brought a drill and drill bit set to use on the chute for the rivet nut inserts. Once the holes were drilled, the riv-nut tool was used to create a threaded hole to adhere the plates. The chute was installed with the plates loosely attached. The team checked the fitting with the machine and tightened the bolts with the plates at the optimum position. Clearance was checked with numerous blank mold cycles.



Figure 9: Assembly Process

CONCLUSION

The adjustable plates have been installed without any fitting or weight issues. The adjustable plates and side curtains have met the customer needs in all aspects. The ideal defect efficiency, durability, affordability, part condition, and transfer success has all been met with the final design. This design was intended to be used for the other "Allrounder" injection molder machines, and has yet to be tested, but has potential to meet this requirement. The adjustable plates and curtains were designed/ theorized for multiple machines and can be reproduced from the project documentation.

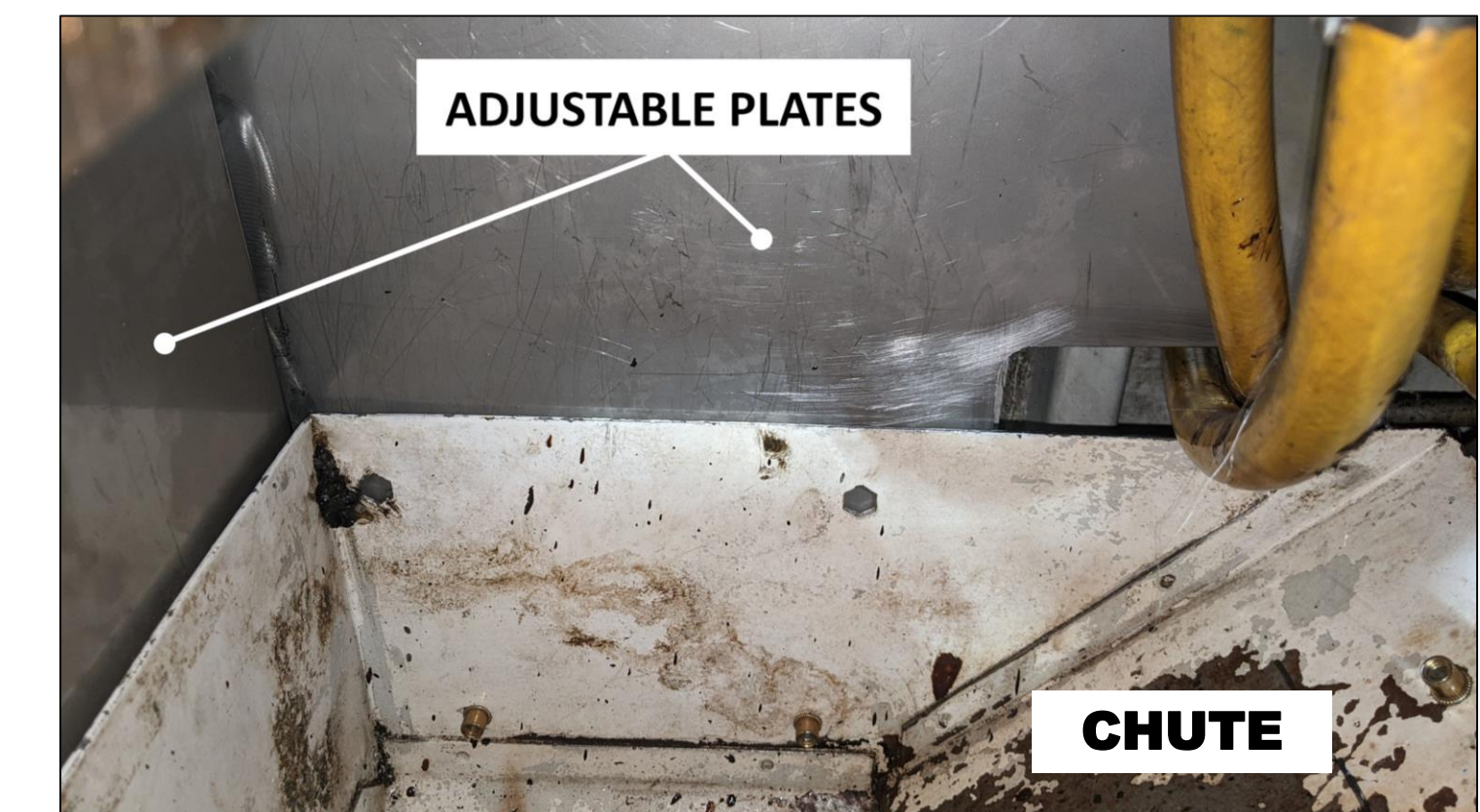


Figure 10: Assembly Process

LESSONS LEARNED

- Throughout this project, the team learned:
- Communications with all involved parties is essential for success.
 - Documentations is just as important as building the project.
 - The first design is almost never perfect.
 - Time management is key.

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