SAND BLASTER MED TOOL TRAY

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ABSTRACT

Mr. Brandon Cathy, a previous Trine DET student, tasked the team with designing a device that could be able to effectively allow for 6-10 medical grade parts to be sand blasted in the same chamber without allowing any part-to-part contact or overspray. Originally, Mr Cathy viewed this project to take the form of a rotary table that be fit within the sandblaster and be rotated externally via possible electronic connections. The way the company was transporting and sandblasting the product was with what was effectively a baking sheet that had all the parts on it and just took the parts to the sand blaster and sprayed the whole thing, leading to parts touching each other and over spray on already sprayed parts. The team started with designing several concepts involving a rotary table, however the team had another idea. Taking into consideration what the sand blaster operator already did, the team designed a tray that not only met all the customer needs and specifications, but also did not change what the operator were already accustomed to. With Mr Cathy's permission, the team developed the tray concept further into a final prototype.

CUSTOMER NEEDS/SPECS

As the project evolved, so did the needs and specifications for the final concept (Table 1). While the project started with a rotary device and eventually became a multicavity tray with lid, most of the initial customer needs remained the same. However, some of the specs changed.

Table 1: Needs and Specs

Needs	Specs
No part-to-part contact	44" x 34" x 35" max size
Completely Removable	Budget of $600 or less
Must Prevent Over Spray	Blast resistant material - metal or polymer at 100 psi
Contact safe material	Device must hold 6-10 parts at 2" x 4"x 6"
Must use blast resistant materials	overspray - 0% at surface level inspection
Safe for the operator	drain > 99% of blast media (collects no more than 1 cup)
	No parts touching each other

INITIAL CONCEPTS

The initial concepts were all based on the product needing to rotate (see Fig 1-4) until late into the detail design phase when the team had the idea that a tray-like design that the sponsor liked better since it worked with current operations.

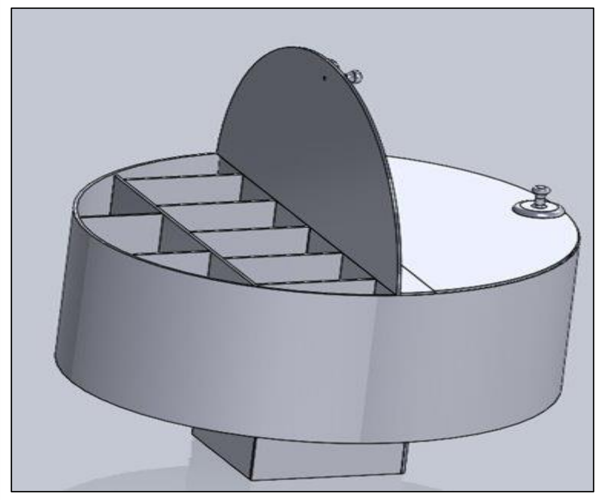

Figure 1: Cabinet Design

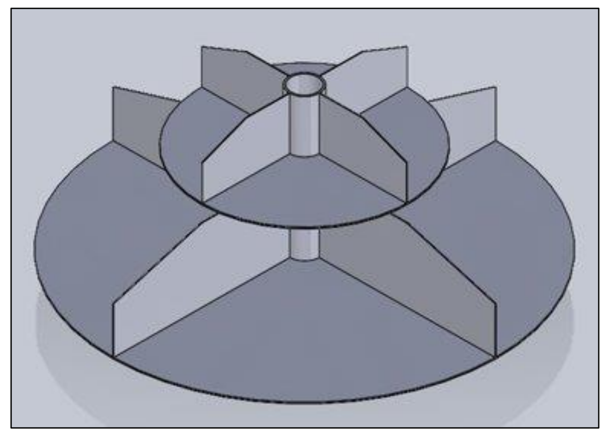

Figure 2: Interior Runoff Design

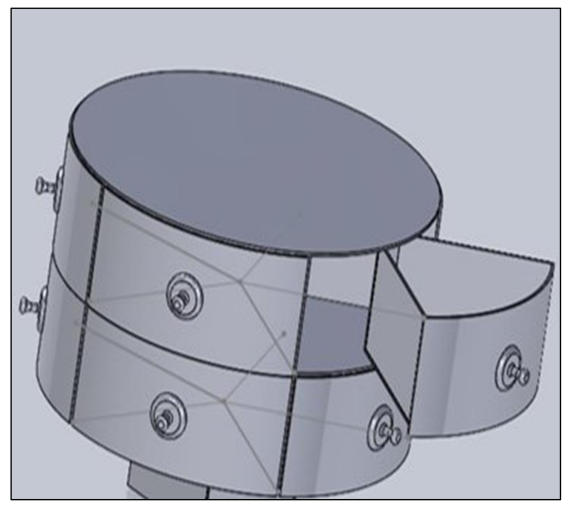

Figure 3: Drawer Design

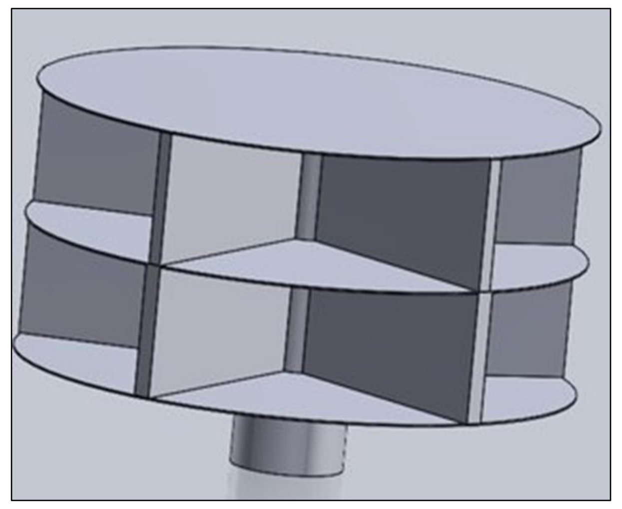

Figure 4: Open Face Design

BUILD PHASE

The build phase consisted of several operations to construct the tray body and the associated components (Figs 5-8).

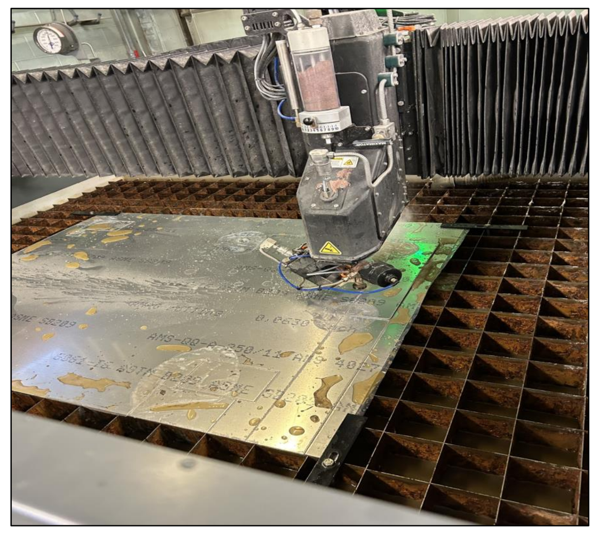

Figure 5: Water Jet Cutting Parts

Figure 6: Jig Built to Attempt the Bends

Figure 7: Tray Redesign after Bend Failure

Figure 8: First Complete Build

FINAL TESTING

Final testing consisted of three major tests: a weight test, material degradation test and a material run off test. Figure 8 shows a basic weight test using buckets of material. For the second test, the team planned to do a material degradation test using the sand blaster that is used by the sponsors company, Figure 9, unfortunately due to safety concerns by the company this test was not able to be done. The process for this test would have been to load the tray into the blasting unit and blast the work plate for a prolonged period in many areas. The third test the team had planned to do was a material run-off test that consisted of spraying blast media in several areas around the tray and recording how the blast media exited the tray or where it remained in the tray.

Figure 8: Weight Test of 80lbs

Figure 9: Sponsor Blasting Unit

FINAL DESIGN

The final design (Figure 10) is a larger version of the industry standard sterilization tray. After taking inspiration from previous work experience at Arcamed, the design was combined with the customer specification to create the final design. The key adaptations are the sand drain holes, modular compartments with stabilization brackets, enlarged handles to allow for easy use in sandblasting PPE, medical contact materials, and silicon secured rivets.

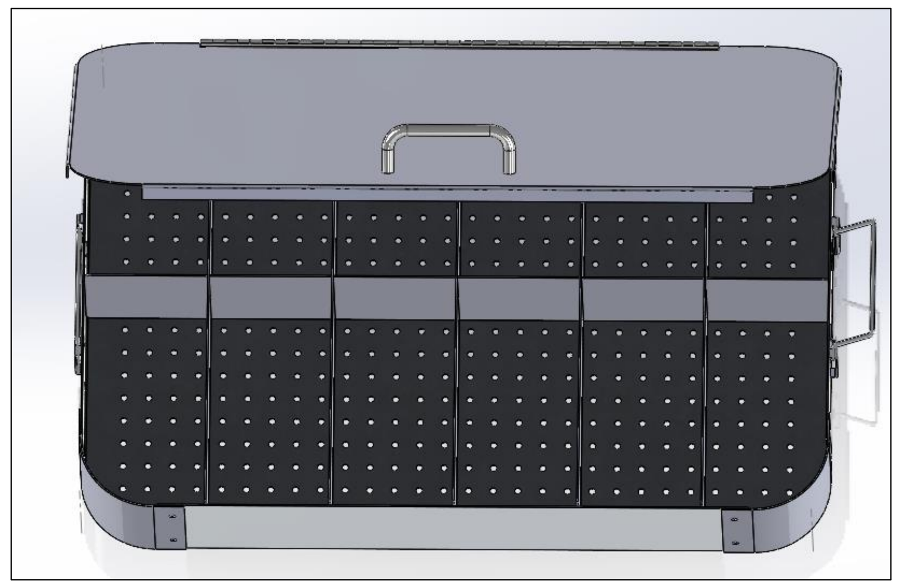

Figure 10: CAD Design

CONCLUSION

The final design is a culmination of multiple industry standards, as well as the adaptations that the sponsor has requested. With the fold away handles designed on the tray to allow for more maneuverability and better ergonomics for the operators. The ease of manufacturing, with the need for only a bend template, silicon, and rivets allows for the potential of mass manufacturing. And the overall size of the build being larger to accommodate both more parts, and to help with the ease of use while wearing sandblasting gloves (Figures 11 – 12).

Fig 11: Final Product Exterior

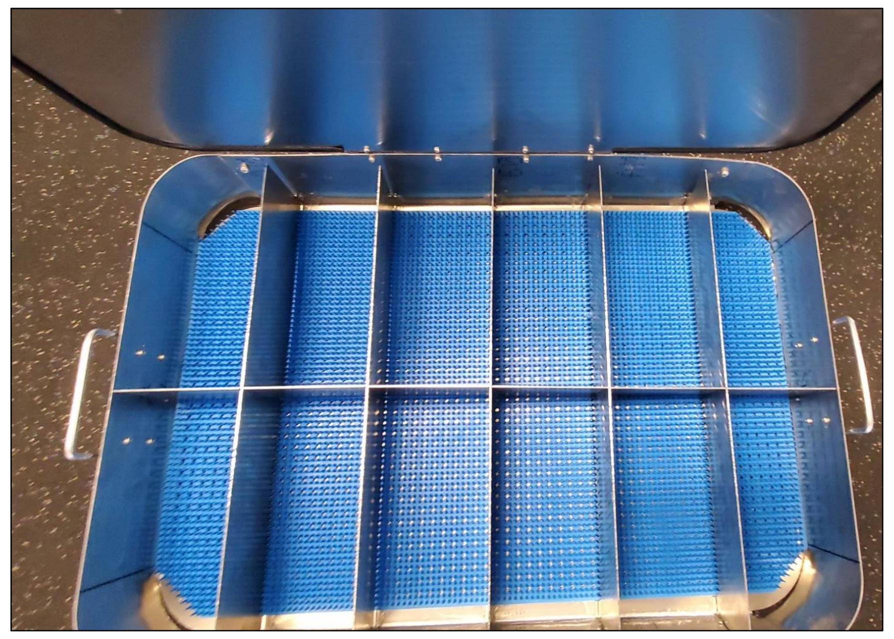

Fig 12: Final Product Interior

LESSONS LEARNED

The team learned a few things during this project:

- 6061 T6 Aluminum is much less malleable than T4
- Bending is a challenge to get dimensional accuracy

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