M1.01 – "El Mandadero" Last Mile Delivery System

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Problem:

"El Mandadero" was designed by a previous senior design team with the help of NXP. The materials used were not compatible with its design purpose. Our goal is to utilize previous drawings while using new material to manufacture a more durable product.

Old	New
• Aluminum	Stainless Steel
• 40 strength polyurethane	60 ,80 strength Polyurethane

Suspension Testing :

Design of Experiments using Multilevel Factorial Design

Variables:

Factors:

1. **Polyurethane strengths (3)**
2. **Metal Finishings (3)**
3. **Torque (3)**

Outputs:

- **9 runs**
- **1 trail each**

Polyurethane Types:

1. ReoFlex 60
2. PMC 770
3. ECON 80

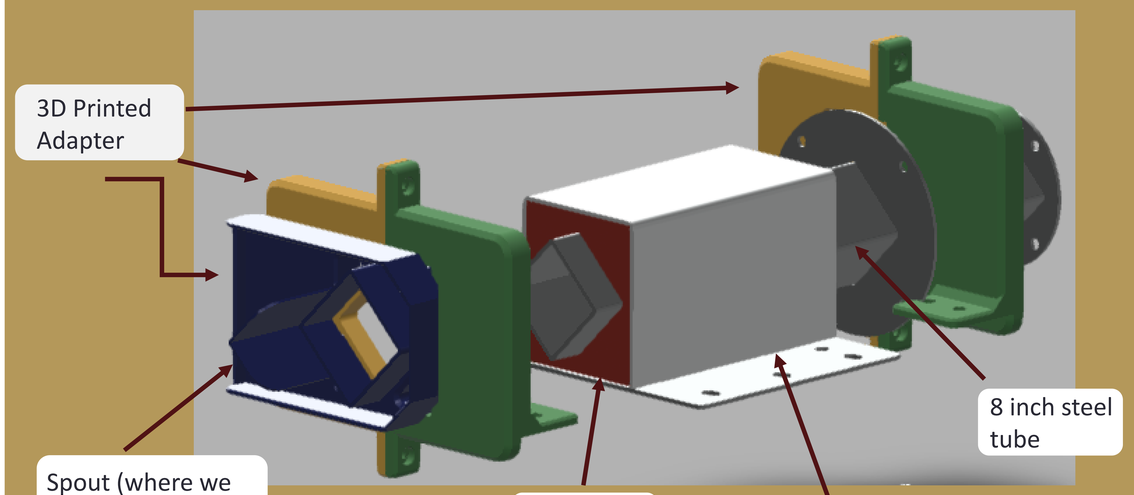
Metal Finishings:

1. Cleaned
2. Sandblasted
3. Untouched

Torque Rotations:

Each trial we will apply 3 different increasing torque levels and plot a curve. We will use the same torsion box to test the trials.

Torsion Box



Tools / Process:

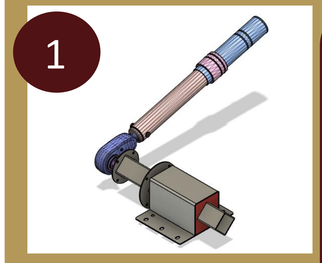
Testing Process

- Clamp torsion box into a fixture
- Attach adapter to end of axial
- Attach a peak torque meter
- Apply increasing torque
- Record data/ plot curve
- Repeat process 3 times

* To save material / time we will be using the same metal & polyurethane strengths for the 3 different torque processes / strengths.*

Tools

1



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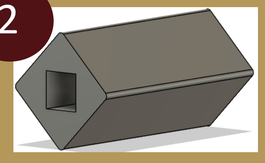

3

The ½" drive torque wrench (1) will be fitted to the square axle tube using the designed adapter (2).

To record data and plot the points we will be using Minitab (3)

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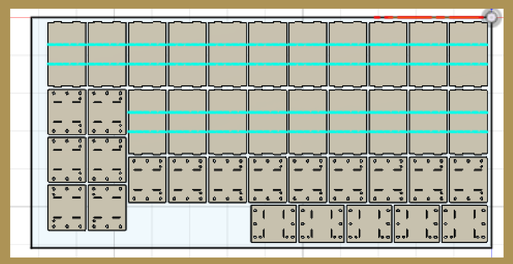
Information

El Mandadero is a delivery rover that offers the customer a modular payload and R&D platform.

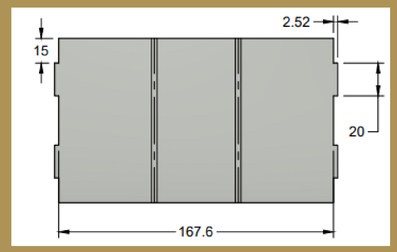
Problem:

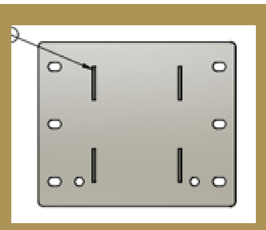
The suspension of the ‘El Mandadero’ is unable to support its own weight. We will be replacing the torsion box material from aluminum to stainless steel and using polyurethane of various shore hardness.

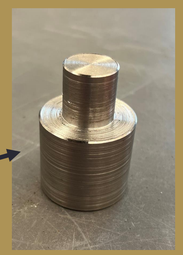
Manufacturing Process



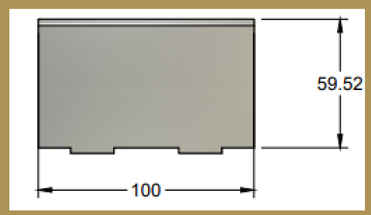
Nesting of the two torsion box components using Fusion 360 to be used on the waterjet.







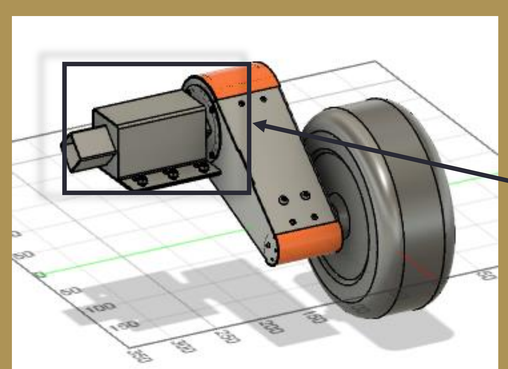
Press head adapter built using the lathe

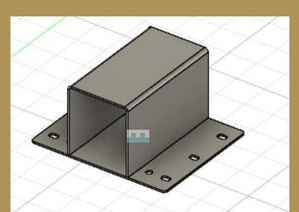


Desired measurements after bending in the hydraulic press.

The 15-ton hydraulic press is paired with the SWAG brake kit to produce the bends within the top bracket of the torsion box.

TIG Welding will be the final process in finishing the torsion box. We will be welding the tabs on the bottom of the upper bracket when inserted into bottom panel to keep in place.





Torsion box

Information

Materials

-1: 16 Ga T-304 2B Stainless Steel
-2: ¼” HR Stainless Steel
-1: 1- ¼” x 1- ¼” x 16 GA T-304 SQ. Tube mill finish
-1: .040” Aluminum 5052-2B sheet
-2: ½” x ½” x 16GA HR square tube

Future Tasks:

-Polyurethane testing

-Vibration testing

-Assembly guide