M2.01 – NXP "El Mandadero"

TEXAS STATE
INGRAM SCHOOL OF ENGINEERING

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Initial Problem

"El Mandadero" was designed by a previous senior design team with the assistance of NXP. Our goal was to improve upon this design by creating a more efficient suspension system and increased stability confirmed with test data.

Manufacturing Changes

Past Design

- Aluminum
- Bolt fasten (for torsion Box)
- 40 polyurethane shore hardness
- No metal texture finishes

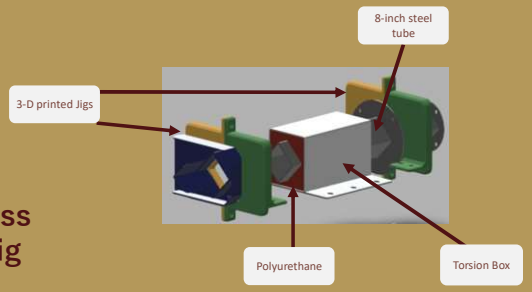
New Design

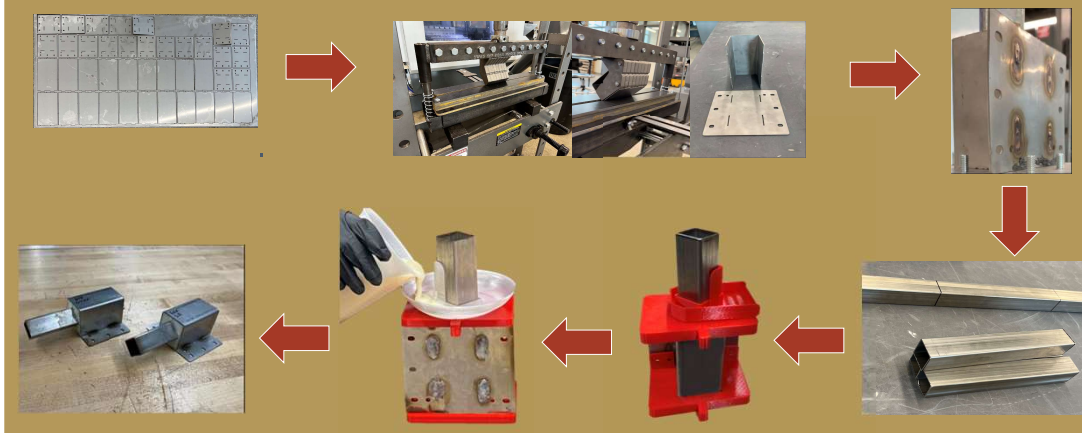
- Stainless steel
- TIG welds (for torsion Box)
- DOE testing to determine polyurethane spring constant
- DOE testing to determine metal finish

Manufacturing Process

Manufacturing Process:

1. Cut panels from sheet metal
2. Bend upper torsion bracket
3. Tig weld torsion box together
4. Cut axles
5. 3D print the jig for pouring process
6. Gasket and hot glue to seal the jig
7. Pour Polyurethane





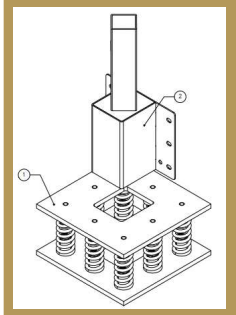
Compressive Test

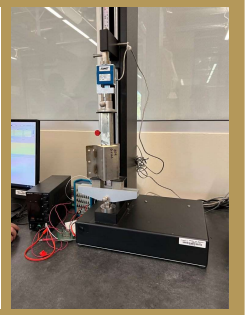
A compressive force was applied to the base of the axle until failure occurred between it and polyurethane spring. The goal of this test was to identify the most effective finish applied to the square tubing and whether the performance difference was substantial enough to add to the manufacturing process.

Torsional Test

The 3 different shore hardness of 60A, 70A, and 80A would undergo a torsional force that would incrementally increase by 10 ft/lbs. the resulting angle was recorded after each cycle. The goal for this test was to calculate the spring constant for each and determine the most efficient in terms of stiffness, fatigue, and deformation.

Compression Testing Analysis





Test	Square Tubing Finish	Shore Hardness	Total Compressive Load	Reached Failure
1	Clean	60A	519.73 lb	No
2	Sand Blasted	60A	519.78 lb	No
3	Grinded	60A	519.57 lb	No

Test	Square Tubing Finish	Shore Hardness	Total Displacement	Total Compressive Load	Reached Failure
1	Clean	60A	0.732 in	1194.624 lbs.	Yes
2	Sand Blasted	60A	0.709 in	1157.088 lbs	Yes
3	Grinded	60A	0.564 in	920.488lbs	Yes

Torsion Testing Analysis