BFGoodrich Spray Gun Modifications

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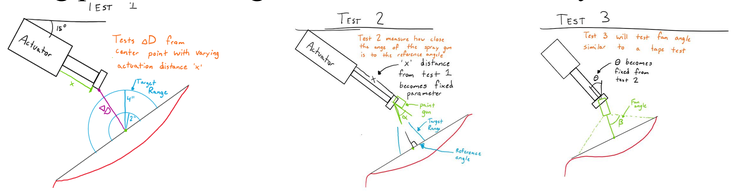
Abstract

This project is a collaboration between BFGoodrich Tires and Trine University students to improve the spray pattern of tires while maintaining readability of their barcode identification. Currently, this spray pattern process can hinder the reading of the identification but is corrected manually. In the next few years, BFGoodrich is seeking to move towards a large-scale automation project that will make barcode identification essential for operation. Together, the team was able to develop an on-campus prototyping device for testing new modifications. Design work was handled by Conner Underwood and Justin Dresbach, Electrical and Computational work was handled by Arie Lowe and Aaron Pike, and Manufacturing and Testing work was handled by Weston Manske and Alex Houser in association with Conner Underwood and Justin Dresbach.

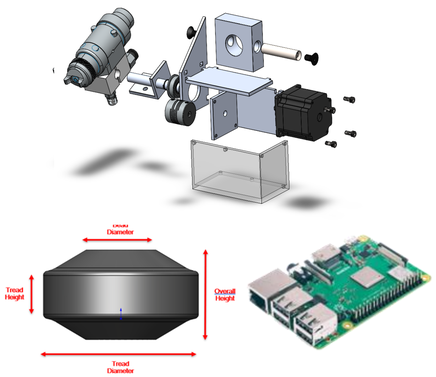
Customer Needs and Requirements

- Develop a new End of Arm Tooling, effective for 70+ varying tire profiles.
- Validate and test the effectiveness of the EOAT through a testing platform designed and manufactured by the team.



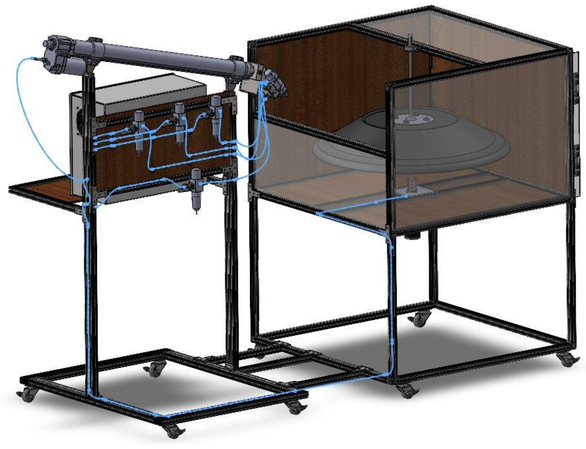
- Paint cannot be applied above the barcode position or the below the tread shoulder.
- Size and weight of the new EOAT must not exceed existing boundaries or capacities at the BFGoodrich plant.

Concept Selection



- Vertical Rotating Paint Bracket
- Full rotation, Top 6” of tire profile
- CNC foam-routed tire
- Raspberry Pi controlled

Design Solution



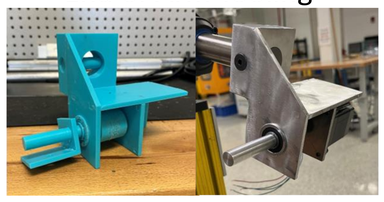
Final CAD model of platform for EOAT testing

Manufacturing

Testing Platform

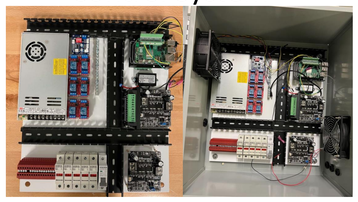
- Framing solely consisting of T-slot framing
- Panels taken from Trine stock

End of Arm Tooling



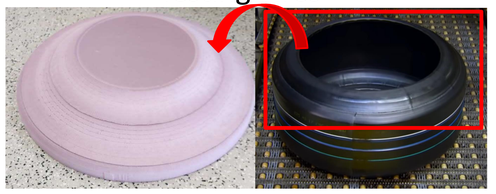
- Bracket 3D printed for test fitment
- 6061 Aluminum Bracket
- Pieces were cut on water jet and TIG welded together.

Control System



- Powered using a Raspberry Pi.
- Switches and buttons on the front allow for manual functionality
- Can switch between Manual and Programming Mode.

Testing Tires



- Profile dimensions provided by BFG4
- CAD models developed using top 6” of profiles
- Profiles CNC routed in 2” sections and glued together.

Testing and Validation

Test 1 (RPM vs Weight):

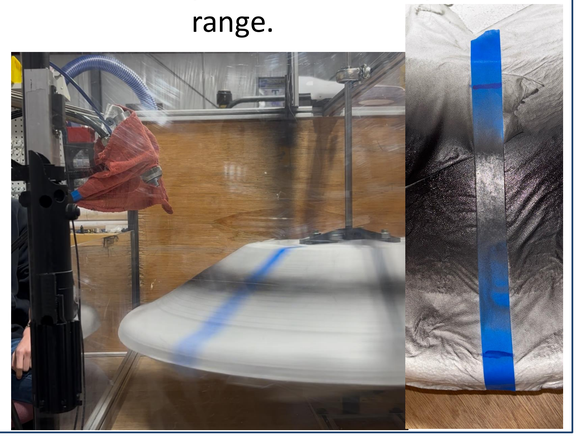
- Unloaded rod spins at 110 RPM
- Each tire weights a different amount
- Test calculates %of max speed vs. rpm of the rod using a laser tachometer.

Test 2 (Spray Angle):

- Angle of spray cone is driven by pressure
- Test calculates the amount of pressure needed to vary the angle of spray

Test 3 (Spray Coverage):

- Test takes a sample spray pattern within a specified range.



Acknowledgments

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