

Overview

Professional cyclists often suffer from slip and fall injuries when cornering sharp turns on slippery roads. Our Tire Friction Test Mechanism is used to quantitatively compare the Entomo Grip spiked tire to an unspiked tire in a dynamic angle change scenario. The test will be used to develop an Entomo Grip Tire which allows a rider to lean more aggressively and prevents slipping out of turns

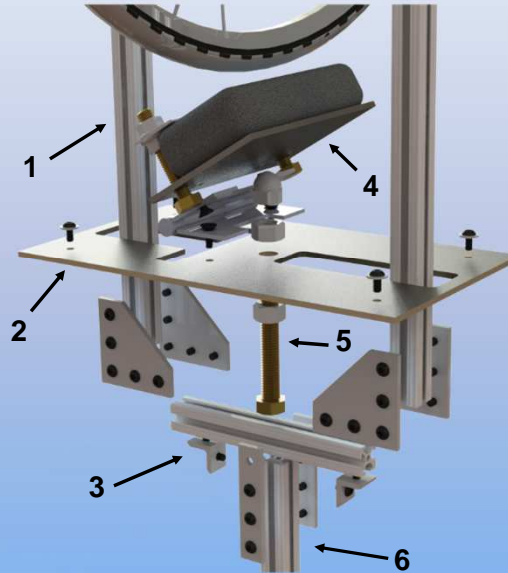
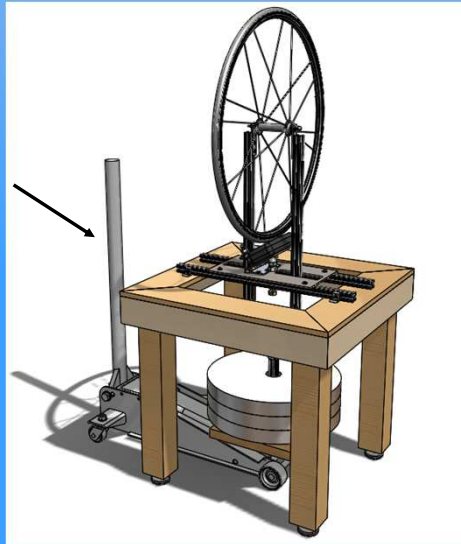
Design Specifications

Engineering Characteristic	Target Specification	Current Specification
Maximum Weight Supported	250 lbs (100 lb, SF of 2.5)	250 lbs
Size of the Apparatus	Within 4x4x6 (ft)	2x2x5 (ft)
Initial Lean Angle of Tire	Within 10°	Within 2° (80/20 ref)
Tilt Angle Range of Plate	30° to 60°	20° to 40°
Time to Run a Successful Trial	Unaccounted For	3 minutes
Success Rate of Trial	100%	~50%

Final Test Assembly

Test Method

- Motorcycle Jack raises and drops loaded tire onto angled asphalt surface
- Ratcheting wrench drives bolt to increase asphalt surface angle until tire slips
- Trials are video recorded and screenshots are analyzed in ImageJ to find max slip angle



Exploded view of Angle Change Assembly

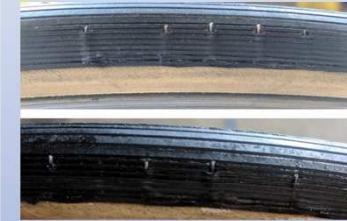
1. Loads Wheel Axle
2. Attaches Plate to Table Rails
3. Adjusts Load to Underneath Tire Contact Point
4. Mounts Asphalt Surface
5. Changes Angle
6. Holds Weight Stack

Image Analysis: Max Slip Angle



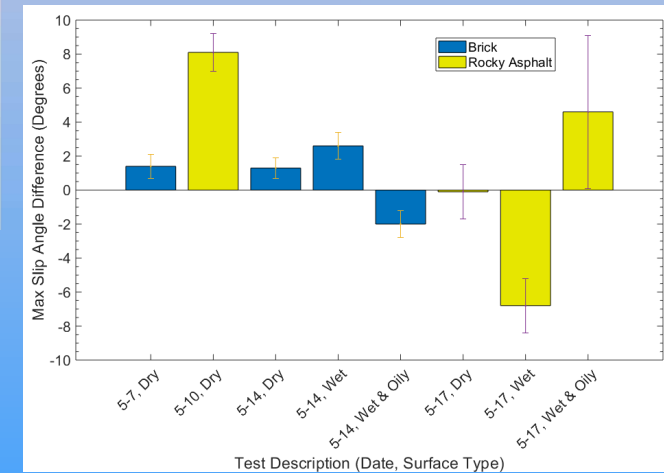
- ImageJ used to find the maximum angle of the asphalt surface before the tire slips.

Spiked Tire Design



- Tires with L-shaped Nitinol spikes embedded into Vittoria Corsa Tire sidewall.
- Spikes are predicted to perform better in grabbing onto asperities in wet and oily asphalt.

Friction Analysis: Tire Comparison



- Each bar represents the averaged difference of the spiked tire slip angle to the unspiked tire slip angle
- 63 trials condensed into 8 averaged differences
- We found the current spike configuration does not improve tire friction consistently

Conclusion

The Tire Friction Test Mechanism was successfully manufactured and tested to specification. Max slip angle comparison will be useful for testing future spiked tire designs. We have found it is a safe, controlled test compared to dynamic slip testing done on the road.

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