

Senior Design Project Description

Company Name	Continental Tire	Date Submitted	June 5, 2017
Project Title	Tire Model Development to Prevent Groove Wander (CONT_GROOV)	Planned Semester	Fall 2017

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.

Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical	5	Electrical	
Computer		Systems	
Other ()			

Project Overview:

“Groove wander” is the effect a driver feels when grooves in a road (placed there for improved safety in wet conditions) interact with a tires treads and cause un-wanted motion in the car’s steering. Traditionally, measurement of groove wander has been a subjective assessment of the “feel” of the steering pull that a driver feels when driving on a grooved road.

This project will seek to understand the current state of the art on this effect and seek to develop an approach for instrumentation of a vehicle to develop a quantifiable measurement of the groove wander effect. The measurement approach will then be tested with test tires specifically designed to validate the test performance and build a groove wander model that can provide preliminary conclusions for tread design techniques to lessen groove wander.

Initial Project Requirements:

Review literature on groove wander to provide basis to advance project as far as possible using prior published data. Gather experimental data in order to build up a groove wander model to include tread rib spacing, rib durometer, tire lateral stiffness, pavement properties, and vehicle suspension lateral stiffness. There may be other characteristics that are added to this list based on the literature search and experimentation. Specific tasks:

- 1) Review literature on groove wander.



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- 2) Meet with Continental Tire Engineers in Fort Mill, SC to get a better idea to develop a common terminology and understanding of groove wander.
- 3) Use laser scanner to measure road grooves. Get depth, width, roughness, and spacing. This data to be used to build road surface database that can be used for testing purposes. Roads used to be within 50 miles of UNC Charlotte.
- 4) Find worst combination of tire, vehicle, and a grooved road. The team will try to experimentally evaluate and characterize what is groove wander.
- 5) Instrument a car and attempt to measure something that identifies groove wander.
 - a) Place accelerometers to measure impacts on steering rack and all four wheel positions (front and rear suspension) and use a data acquisition system to record values.
 - b) Install a high speed camera looking into the contact patch.
 - c) Develop quantifiable test approach to compare with traditional subjective approach
- 6) Generate a model hypotheses based on experimental approach.
- 7) Design tires that seek to generate worst case effects which cause groove wander. Tires to be designed by students and produced and supplied to team by Continental.
- 8) Verify model by road test.

The final product is to explain the Groove Wander phenomena with the help of experimental data and build up a groove wander model.

Expected Deliverables/Results:

- Conclusions of current literature concerning best practices on groove wander design and analyses and developing hypotheses for a Groove Wander model
- Testing database and evaluation for road surfaces in the Charlotte area
- Instrumentation and data collection technique to quantify groove wander
- Groove wander model developed using experimental data measured and literature.

Disposition of Deliverables at the End of the Project:

Test tires to be given to Continental at the conclusion of the Expo along with all experimental and model data. Developed/ acquired instrumentation to be taken into possession by Continental unless otherwise agreed.

List here any specific skills, requirements, knowledge needed or suggested (If none please state none): Motorsports concentration