2014

Development of an inexpensive tire softening agent from readily available materials to improve traction in race car tires

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Aha! Creative Inquiry CLEMSON

Development of An Inexpensive Tire Softening Agent from Readily Available Materials to Improve Traction in Race Car Tires

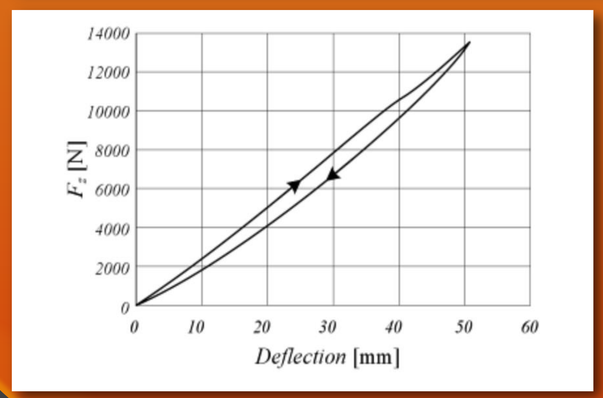
Purpose

Primary hypothesis: Effective tire softening chemicals comprise certain chemical functionalities, which can be obtained by mixing readily available, inexpensive, and non-toxic materials.
Big Questions: Do tire softening compounds have an effect on tire performance? How can this effect be quantified? How can this effect be improved?

To test this hypothesis, the students will compare the performances of five different mixtures of chemicals with that of a professional tire softener.

They will then postulate generalizations about how chemical makeup in a softening agent contributes to performance.

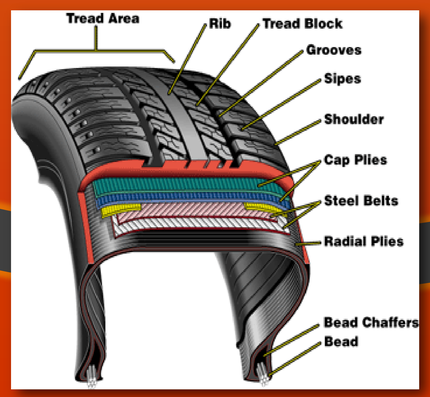
Finally, they will create a mixture of their own based on their findings and test it against the other softeners.



Above Right: Instron machine used for testing material properties like hysteresis
Above Left: Clemson Formula SAE is supporting this project by providing used tires for sampling as well as technical support
Left: an example of hysteresis, which is the difference between the area under the two curves in the plot
Below: Diagram of average tire construction. Source: www.discounttiredirect.com

Test Re-Evaluation

When evaluating our initial testing, we concluded that another approach needed to be taken. There was too much variability in the data to draw viable conclusions. Our new approach consists of testing individual strips of rubber from the same tire with the tire softener applied. We will be testing each strip for its inherent hysteresis using an Instron machine. What this machine does is stretch the rubber at a certain frequency and reports the hysteresis measured. From this data, we will be able to tell whether or not the tire softener has a profound effect on the grip of the tire.



Future Test Plans

- We will treat the tread rubber samples with the five different compounds (xyelene, toluene, acetone, hotlap, mineral oil).
- The rubber samples will be run through hysteresis testing to determine quality of grip.
- We will use statistics to quantify differences in sample performance compared to a control.

In our research on grip, we found out that grip is based on the amount of hysteresis in the tread rubber of the tires. The more hysteresis, the more grip. Hysteresis is the energy loss between the depression and return of the rubber when a force such as the road is applied. The area between the two curves is the measured hysteresis.

Professional Guidance

We met with engineers from the Michelin Americas Research Company to learn more about tire dynamics and how a tire grips the road. We look forward to working with these partners more in the future to enhance our learning and guide our project.

Team Contributors

Undergraduate Members: Brandon Alverson, Beau Bennet, Davis Carmichael, Sean Dix, Cameron Ellis, Amber Laird, Sarah Lowum, Caitlin Smith, Dedrick Smith, Christopher Stuart, Baxter Ward, Kenny Brown

Advisor: Dr. Rachel B. Getman

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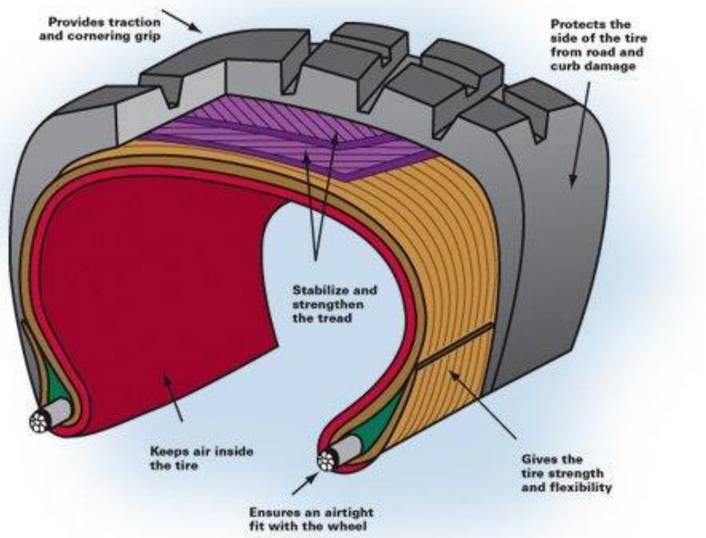

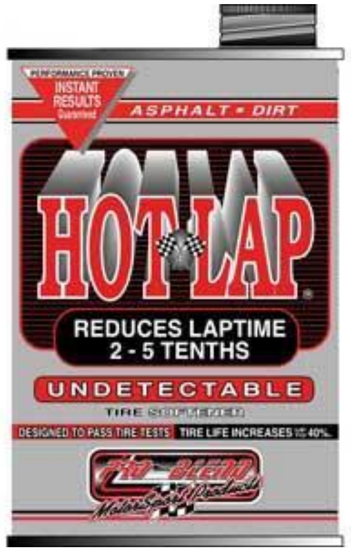

Things to add:

- Who we are, how we got started (Bax)
- 1st Semester Data (Bax)
- Research on Grip (Sean
- Re-Evaluation of Approach (Sean)
- Involvement with Michelin (Kenny)
- Experiment Plan (Kenny)