Bulldog Racing - Baja SAE 2017

Mechanical Engineering

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Abstract

Fresno State's chapter of the Society of Automotive Engineers is competing in the Baja SAE competition hosted in Gorman, California April 27-30, 2017. The motivation behind this year's design is to improve upon the 2014 competition vehicle which placed 35th out of 110 teams. This year's design consists of a tube frame made of 4130 alloy and includes a reduction in wheelbase from 2014. The car is powered by a 10hp Briggs and Stratton engine with a continuously variable transmission providing a top speed of approximately 34 mph. The steering design optimizes proackerman steering. The vehicle's suspension utilizes an unequal, unparallel double A-arm front suspension, a custom rear trailing arm to improve upon shortcomings of the 2014 vehicle, and custom Elka Stage 5 coilover shocks. The design, analysis, fabrication, and testing of these features help students gain real-world experience to prepare them for a future career.

Chassis

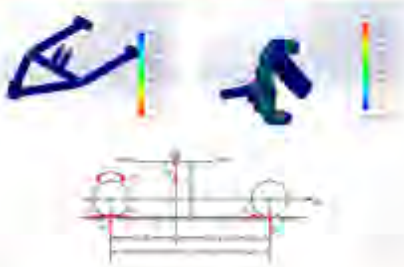
The chassis is a tubular space frame made of 4130 Chromoly Steel. This material is used frequently by teams due to its' high strength to weight ratio. Chassis design was improved by increasing maneuverability and driver ergonomics. These improvements were made by reducing the vehicle's wheelbase and transitioning to a "no-nose" design.

Suspension

The front suspension design is largely based on the 2014 vehicle design which proved to be very robust and effective. This design utilizes unequal length, non-parallel A-arms made from 4130 alloy steel tubing. Major changes were made to rear suspension design this year. The rear trailing arms provides parallel, planar motion for the rear tires. This improves the straight up and down trail of the tire and keeps the contact patch in the same location laterally. This trailing arm also gives the opportunity to mount the shocks parallel to the length of the vehicle. This year's design uses custom built Elka 5 Stage coilover shocks.

Final Vehicle Design

Analysis



Drivetrain

Baja SAE provides all teams with a 10 HP Briggs & Stratton that they must use without modification in their vehicles. The final drive of the vehicle is then up to the team to decide. The current team utilized a CVT (Continuously Variable Transmission) out of a Polaris Ranger XP and a final drive out of an EZ-GO gas golf cart, since it proved to be very effective at the last competition.

Fabrication

Students learn a wide variety of fabrication techniques in order to build their cars which give them hands on experience in an industry-like setting. This involves notching and bending tubing, welding, and various material removal processes.

Baja California Competition

The team will competing with the new vehicle in the Baja SAE Collegiate Design Competition this April 27th-30th in Gorman, California. The competition involves technical inspections, formal presentations, and dynamic events. The dynamic events are the highlight of the competition and include events such as a hill climb, maneuverability test, and a 4 hour endurance race. Teams from universities all across the US and the rest of the world will be competing in this event.

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