Formula Technion Racing Team

Chassis & Integration Team

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Advisor: Zvi Fruchter

Abstract

This year's **Chassis & Integration Team** had to combine two different tasks that are interrelated, the design of the chassis and the placement and integration of various components in the vehicle. We defined one leading mission – minimize vehicle size in order to obtain low center of gravity, low mass and low inertia moments. This defined our main vehicle features: Reclined driving posture, lowered and tilted engine with dry sump, substantially shorter chassis with no rear section and weight goals for all systems. The car height was reduced to 1 meter at its peak, a change of 20% compared to last year and a mass reduction of 15%. To achieve this, we used CAD and analytic tools in order to reduce the amount of chassis structural elements used, minimize the shapes of the brackets and diminish the empty spaces among components.

Project Objective and Requirements

The **Chassis & Integration Team's** objective was to design a chassis that would be of smaller dimensions than the 2013 chassis, would weigh 20 percent less and to manufacture it from 4130 Steel, at the highest possible accuracy so that the CAD model dimensions as far as integration of the vehicle is concerned would apply.

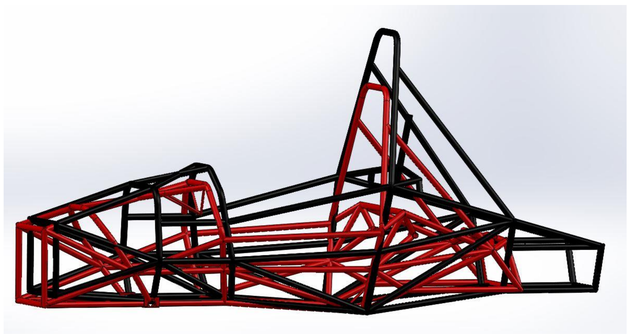
Product Description

The new chassis design

The design of the new chassis was focused on the size and shape of every component in order to build a strong and rigid structure which would withstand with the forces and moments that are applied on the chassis under racing condition. In this way, a smaller and more optimal design was achieved.

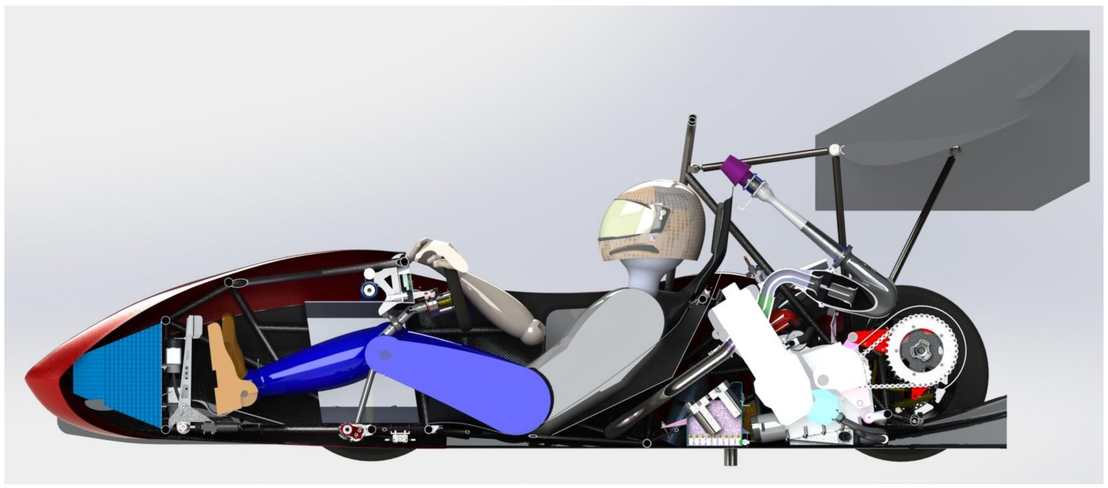
2013 Chassis

2014 Chassis



Functionality of the components' integration

- The several components are distributed mainly in the rear part of the vehicle around the engine
- The driver's seat design and placement maintains a declined driving position to keep a low center of gravity
- Many brackets combine mounting of more than one components, such as the steering wheel and the front suspension shock absorbers, the rear engine part and the differential, the fuel tank and the battery.

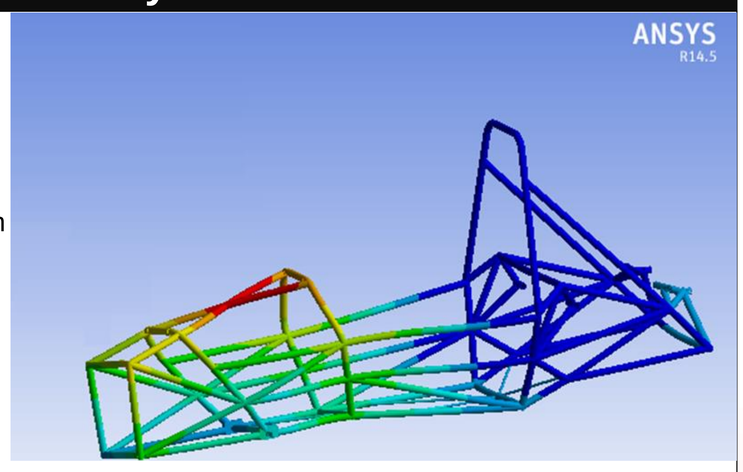


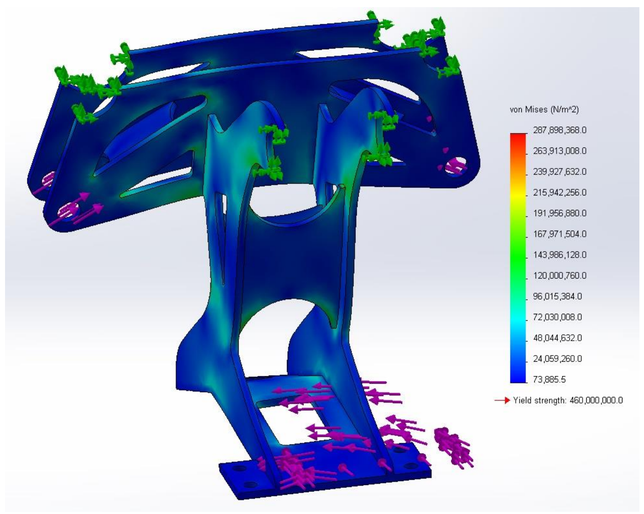
Mockup model

- A mockup model was manufactured out of MDF plates cut in CNC to inspect the FSAE rules of 2014
- An adjustable steering wheel mount lead to the most ergonomic position of the wheel to achieve the driver's comfort

Analysis

Different scenarios imitating the stresses on the chassis under extreme conditions, such as braking hard while taking a sharp turn were examined on analysis software. From the conclusions of the analyses supports were added so that the stress of the material along the structure would be uniform.





Analyses were also performed on the brackets to ensure their sustainability under extreme conditions, depending on the component mounted, from which the value of the force/moment applied is derived.

Final Product

The accurate manufacturing of the chassis was ensured by using custom jigs, made from a steel plate cut by laser. The jigs were placed in specific locations along the chassis to hold the structure for the welding process preventing any movements of the tubes.

The assembly of the tubes was possible by laser cutting (notching) of the edges for a close fit.

One of the jigs was actually the engine itself, which was held in place by other jigs. In this way, the engine was placed in the exact angle and position as in the vehicle in the end.

Acknowledgements

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