Designing an All-Wheel Drive, All-Terrain Vehicle for the 2022 Baja SAE Competition

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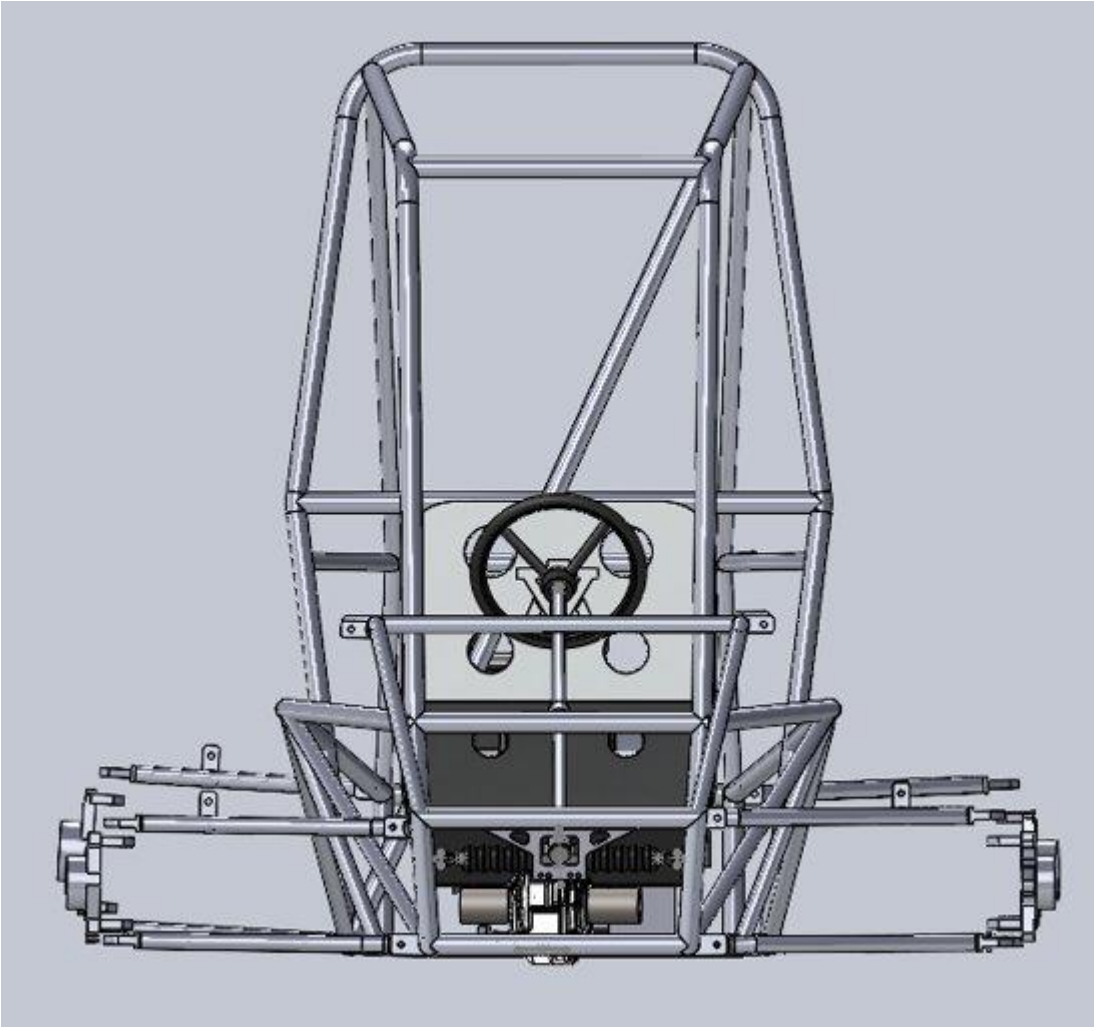
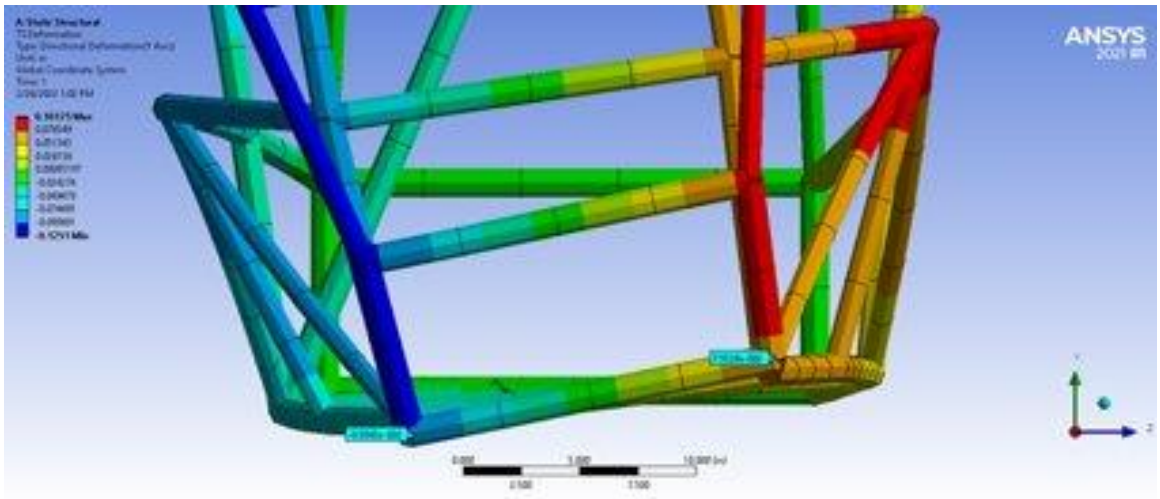
The Baja competition is one of many competitions hosted by the Society of Automotive Engineers (SAE). Every year hundreds of team from around the world gather at various testing sites to go head to head and prove just who the best is. There are many different tests during the stretch of the competition with ultimate event being the endurance race, where teams run their vehicles for hours around a track and just hope to survive and complete as many laps as possible. All of this sat heavy in the minds of the 2022 team as they prepared their vehicle. Some of the major goals for the team this year were to run an All-Wheel Drive (AWD) vehicle, have a lighter frame and run more in depth analysis on all components of the vehicle. Each of these would eventually join together to have this team be the most competitive and successful team that VMI has ever had a competition.

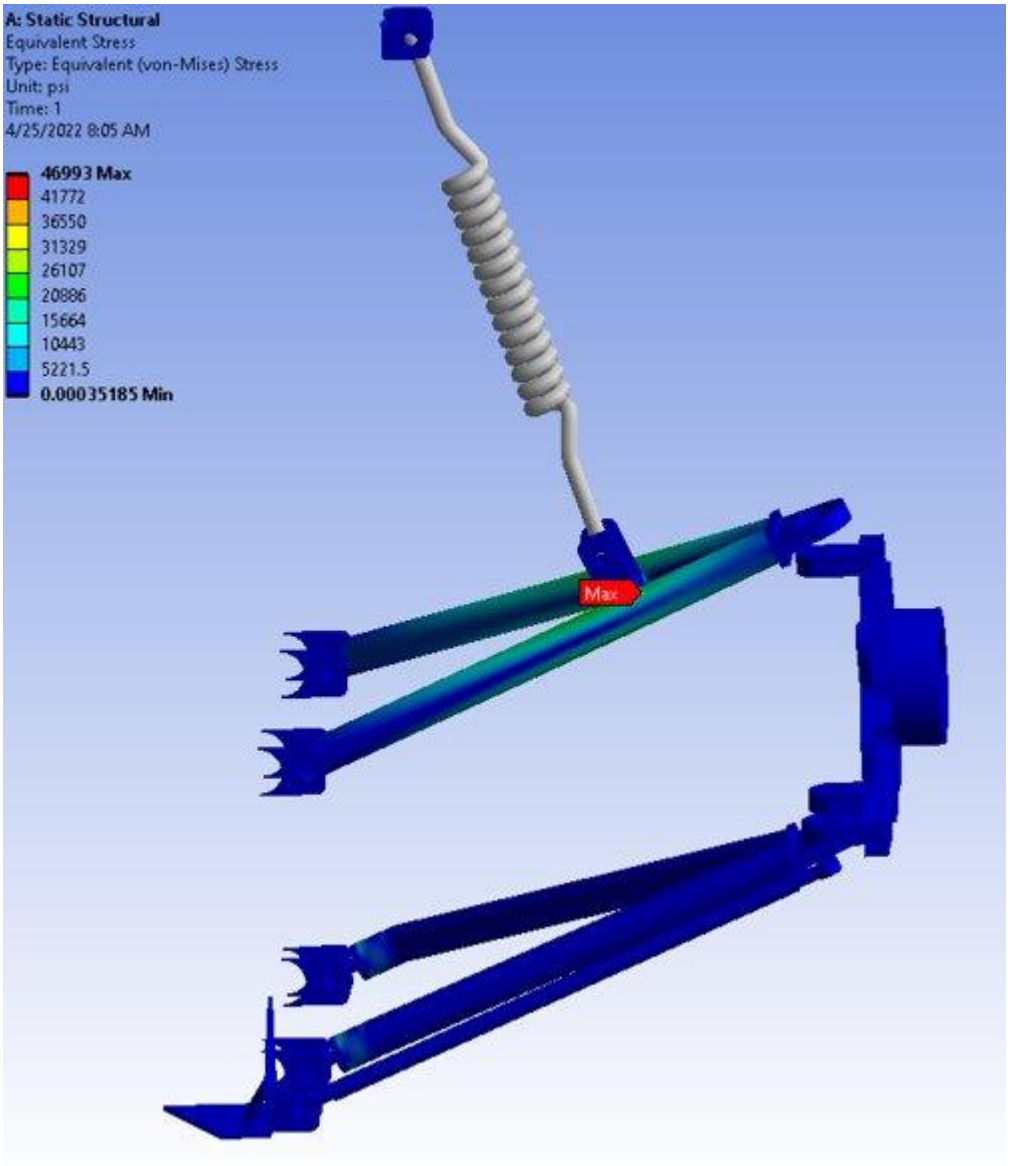
The entire vehicle begins with the frame, made of both 1.25”ODx.065 and 1”ODx.049 4130 steel tubing the frame went through multiple different iterations of design before undergoing in depth analysis in ANSYS under several different simulations of loading. Following the frame is the drive train, the entire vehicle is powered by a Briggs and Stratton 10hp engine. This was engine was then connected to a 2016 Polaris RZR XP1000 gearbox via a Continuous Variable Transmission (CVT) assembly. This gear box was then connected to a RZR XP1000 front differential via a centerline driveshaft to allow the vehicle to have AWD capabilities. Both of these drivetrain assemblies were connected to 22 inch SunF tires via conjoined Polaris Sportsman and RZR hubs and custom made aircraft grade aluminum knuckles in both the front and rear. With the vehicle now rolling it had to be able to stop and this was made possible through the use of Tilton master cylinders and Sportsman discs/calipers connected to each other via AN3 brake line and fittings. To allow the vehicle to handle bumps and jumps a suspension system featuring Fox EVOL3 air shocks and custom made control arms were placed

onto the vehicle. To have the vehicle steer and look good ergonomics and steering worked together to use a standard steering rack at the front of the vehicle connected to the steering via toe links.

One of the aspects of the competition involve static events one of the main ones being a business presentation. The business presentation prompt this year asked each team to design and figure out the logistics for a Baja Race at the annual SEMA convention held in Las Vegas. To accomplish this the team utilized Google Earth to create a race course and an Excel workbook to create a business background and logistical plan for the event.




ANSYS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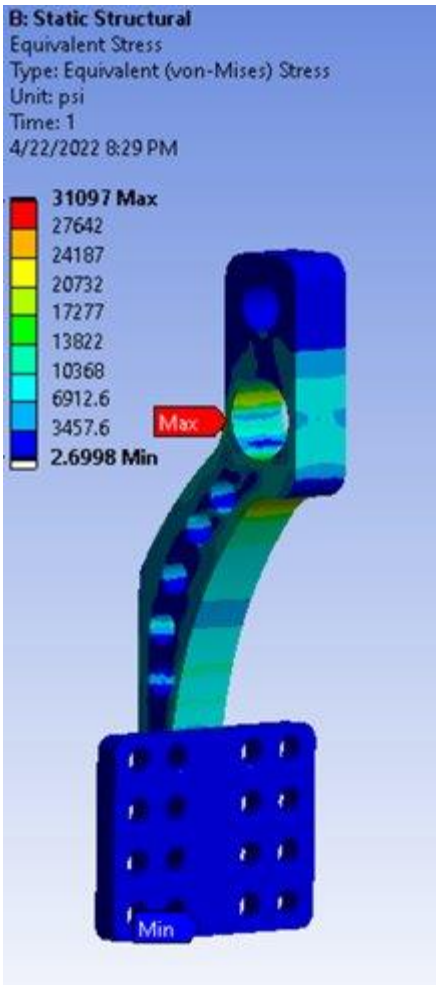
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2.6998 Min
Max
Min