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## **Vex Robotics Competition and Automotive Engineering in the Real World**

The first automobile, made by Karl Benz, was built in 1885. Today, over 1.4 billion cars exist across the world. This ever increasing number grants engineers the unique opportunities to make a widespread and lasting impact. The STEM career that we selected was automotive engineering. Automotive engineers are engineers who aid in the design and production of entire vehicles or pieces of vehicles; they play a crucial role in the development of the cars, ships, and planes that run our world.

We chose automotive engineering because vehicles are continuously changing and with the rise of climate change comes a rise of entirely new hurdles to overcome. Engineers strive to maximize efficiency and find cleaner fuel alternatives. Another reason why we chose automotive engineering was because the design process used by automotive engineers is deeply related to the work we undergo as a VEX Robotics Competition Team. Throughout the competition season, our team designs and builds our own robot from scratch, following many of the same methods and procedures.

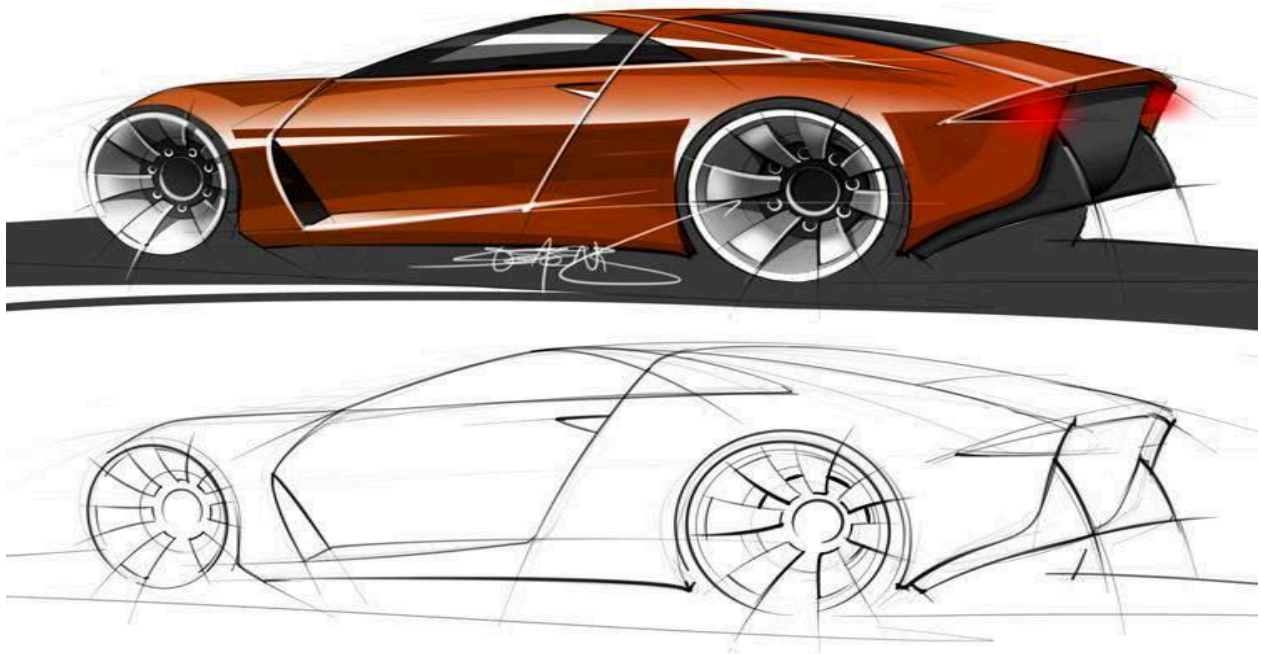


[Automotive engineering students designing a car]

By: Clemson University

To further learn about automotive engineering and the process in which engineers design vehicles, we read an article written by Rivian, an American automotive company aiming to combat climate change through sustainable vehicles. Rivian published an article named "Inside Our Design Studio" which highlighted and summarized the work that happens in their design studio. According to Rivian, they undergo a complex process to finalize any design, "...our sculptors bend and twist over the life-size models, skillfully hogging, raking, and steeling - terms used to describe each phase of the modeling process - while ribbons of clay fall to the floor and the vehicles' features begin to emerge." We also looked at another article written by Wayken Rapid Manufacturing called "Automotive Design Process: From Concept Ideas To Production".

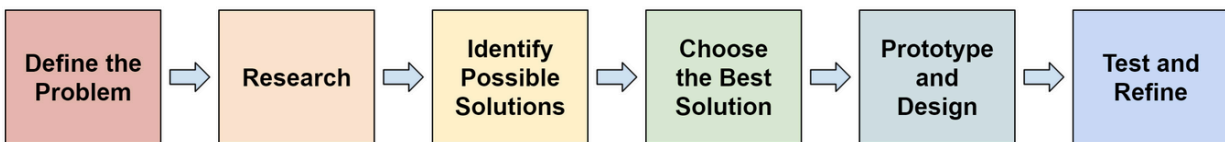
The article states that there are around 11 steps to the design process of a car from the basic sketches to the sculpting and creation of the car; these 11 steps can be divided into four groups.



[Initial Sketch of a Car Design]

By: Wayken Rapid Manufacturing

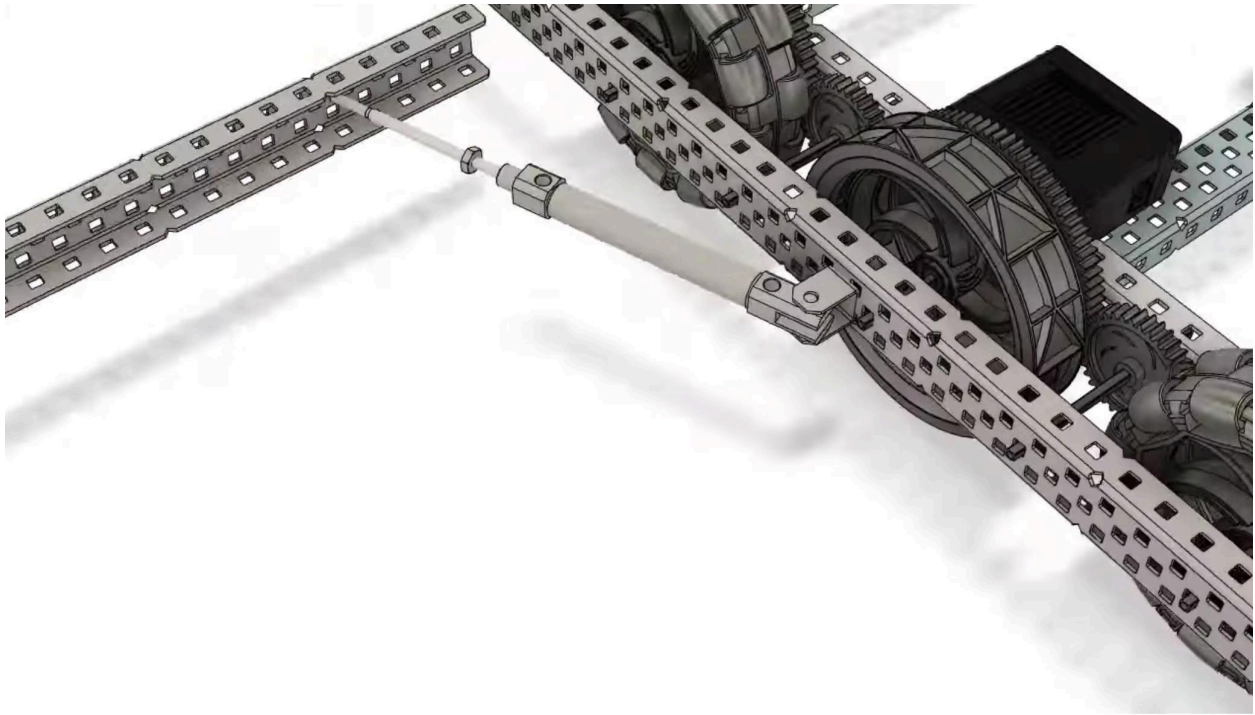
The first part of the design process is identifying an outlying problem. The problem can range from developing a more innovative design to reducing weight and gas mileage. A company leads with identifying the problem because it sets the foundation to the development of a new vehicle. This correlates to the process that we undergo in the VEX Robotics Competition as we first analyze the game. A key factor in being able to create an effective robot is knowing what the robot must accomplish. This develops an important skill, as we first are required to plan out and identify the problem before we tackle it.



[A Graphic of the Basic Design Process]

By: Purdue Sigbots

The next step to the design process of a car is the packaging considerations and 3D modeling. Packaging considerations is the process of implementing engine availability and safety requirements. Designers and manufacturers must reach a compromise on the design and creation of models. The aim of 3D modeling is to put a perspective of the design and the functionality of a vehicle. As we design our robot for the VEX Season, we both utilize packaging considerations and 3d modeling. First, we must consider where the brain, battery, and radio must be as they are sensitive pieces to the robot and must be placed beforehand. Before we start prototyping and designing the robot in person, we use a 3D modeling software called Onshape. This allows us to manage our time better and put into perspective the different subsystems of the robot. 3D modeling also allows us to ensure that our parts fit together without bending, as the software will not work if parts are misaligned..



[A CAD Design of a Drivetrain and Pneumatic Wing]

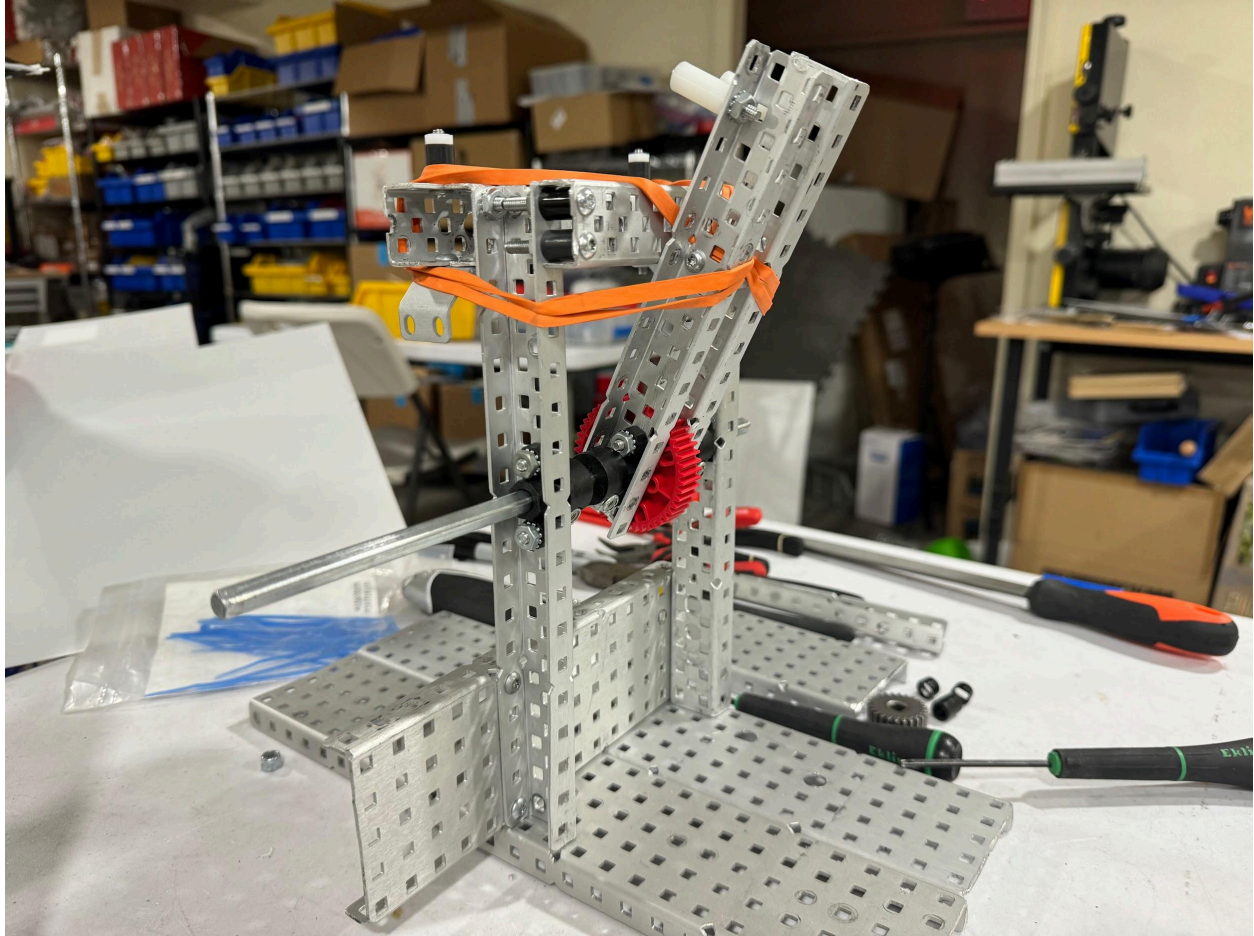
By: Vladimir Makarov

[https://www.youtube.com/watch?si=dme4y71p03npYX\\_M&v=-Gya0xZHjP0&feature=youtu.be&ab\\_channel=VladimirMakarov](https://www.youtube.com/watch?si=dme4y71p03npYX_M&v=-Gya0xZHjP0&feature=youtu.be&ab_channel=VladimirMakarov)

The third step of the design process of cars and vehicles is clay modeling. This is a way for companies and designers to prototype their designs to make sure that they are effective and there are no faulty designs. During our VEX Season, we also turn to prototyping before finalizing any designs as it is the easiest and most efficient way to confirm and test new designs. This teaches us how to efficiently design and prototype different systems instead of going through a lengthy trial and error period.



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ROBOTICS



[A prototype that was designed by Team #62880B]  
By: Team #62880B



[The Clay Model of a McLaren P1]

By: Wayken Rapid Manufacturing

The final step to the design process of cars and vehicles is finalizing designs and starting manufacturing. This step is to finalize designs, test the product, and make sure that nothing is faulty or a safety hazard. This step is crucial during our VEX Season as we must make sure that our design solves all the problems and challenges, and that we comply with all the rules and regulations of the VEX Game Manual.



[Finalization of Car Model]

By: Wayken Rapid Manufacturing

VEX Robotics Competition prepares us for the future not only in engineering careers, but many others as well. We are taught the design process and basic structure of how problems should be tackled. Challenges can be found commonly in any workspace, and the VEX competition only pushes us to learn and socialize even further. From the competition alone, we are taught socialization from the members in our team to other teams as well during competitions. These skills are crucial to the development of skills in a workspace.