# ENGINEERING WITH FERRRAR

**10012K WEST VANCOUVER BC CANADA** 







# **CONTENT**

01 ABOUT US

05

06

**08** 

09

- 02 INTRODUCTION
- 03 WHAT IS S.T.E.M.
- 04 WHY FERRARI
  - FERRARI DESIGN PROCESS
  - VEX DESIGN PROCESS
- 07 SIMILARITIES
  - HOW IS VEX PREPARING US FOR A CAREER IN STEM

BIBLIOGRAPHY

# **ABOUT US**



Parv M 14 Years old

- First Year in VRC
- 2nd Year in Vex



Rian C 14 Years old

- First Year in VRC
- 4th Year in Vex



Charlie Y 14 Years old

- First Year in VRC
- 4th Year in Vex

• Programmer and Engineering Notebook

• Builder and Backup Driver

• Driver and Backup Programmer

## **INTRODUCTION**

This presentation aims to highlight parallels between VEX and STEM design processes, in addition to explaining how VEX prepares us for a future in the S.T.E.M Industry. The company I selected to research for this challenge is Ferrari, a car company that continues to revolutionize the world with their advancements in technology.

# 



## WHAT IS STEM?

STEM, an acronym for science, technology, engineering, and mathematics, demands innovation, problem-solving, and critical thinking. Working in the STEM field requires a passion for discovery and continuous learning, given the constant evolution of the STEM industry.





## WHY FERRARI?

Ferrari represents a pinnacle of engineering excellence and innovation in the automotive sector. They obsess over the development of cutting-edge cars, iterating through each component to deliver superlative speed, comfort, and performance.





## FERRARI DESIGN PROCESS

### 1. Conceptualization

This phase involves brainstorming and generating initial car design concepts. In this phase, Ferrari defines their goals and strategize on how to achieve them.

### 2. Blueprint

In the Blueprint stage, Ferrari sketches out conceptual ideas and creates physical and digital renderings to visualize the design.

### 3. Prototyping

A key factor in Ferrari's design success is the Prototyping stage. Virtual simulations test car performance, followed by physical designs for validation, ensuring thorough testing and refinement.





### 6. Finalize

Finalizing the design concludes the process. Ferrari develops detailed blueprints and manufacturing specifications, implementing them into production. They oversee manufacturing and the final product.

### 5. Test and Refine

Testing and refining are crucial in the design process, ensuring safety and luxury. Extensive testing, on tracks and in real-world conditions, is conducted to evaluate and enhance the design.

In this phase, Ferrari collaborates with engineering teams, integrating the design with the vehicle's mechanical and structural components. They ensure it meets safety, performance, and regulatory requirements.

4. Build

## **VEX DESIGN PROCESS**

### 1. Brainstorm

In this stage we define the objective of the game and develop ideas for a robot that best fulfill the Vex Challenge. During the design phase we sketch out plans in our engineering notebook and compare ideas with different teams deciding on which design works best.

2. Design

### 3. Build

In this phase we start to build our robot. We iterate through our design and refine it as new challenges arise!





### 6. Finalize

In this final step we carefully analyze each and every component of the robot and make sure the robot is competition ready with very little to no faults.

### 5. Improve

The improving stage is where we overcome challenges that we encountered during testing. Enhancing our robot allows us to fix any flaws and prepare for tournaments!

### 4. Test

The test phase is arguably the most important part of the Design Process. We do practice runs which enables us to identify areas of improvement.

### CONCEPTUALIZATION







Ferrari F430 Spider Targa Concept Link to Image

Conceptualization and brainstorming are different words to represent the same idea. In the picture on the right, we brainstormed the components needed for our robot to meet Over Under's objectives. This process almost mirrors how the Ferrari engineers meticulously designed the Ferrari F430.

# 10012K

### BRAINSTORMING





### 10012K's Brainstorming

### BLUEPRINT



Ferrari 599 GTB Fiorniano Blueprints

The Blueprint and Design stage in both of these processes are almost identical. Ferrari and 10012K both sketch out our designs physically and digitally to scrutinize if our plans can be carried out with perfection.

Link to Image

# **10012K**

### DESIGN

### First thoughts on the drivetrain/planning Either a 6 motor or 4 motor (11w) drivetrain Pros about a 6 motor drivetrain: Pros about a 4 motor drivetrain Has a powerful and consistent output Much lighter than a 6 motor drive Has more power than a 4 motor Takes up less space for other drivetrain components Will not get pushed around as much Utes less energy Can have a higher top speed (using the Quite simple gearing) as you do not have to worry as Cons: much about torque Can be pushed around by stronger Cons: robote Heavier, wastes more power, takes up-Less power output compared to a 6 space, leaves less motors for other motor uses, more complicated Has to be focused more on torque to make up for loss of motors. Choosing the amount of wheels for the drivetrain We plan to use a 3.5 gear ratio using the Using examples of other teams robots (Max Gao, 36t pinion and 60t spur. With this gear William Cheng), we think the 6 wheel drive would ration, we would most likely run the blue be optimal for this year. We think that the 4 omni, gear box inside the motor. and 2 traction wheels will be the best combination. as has both attributes of being stable, and having being maneuverable. - traction wheels will stop sideways sliding. We also carefully agreed that the base should be 25x30, using all aluminum C channels 1x2x1x30 1x2x1x25

### 10012K's Designs and Thought Process

## PROTOTYPING



In this step Ferrari creates simulations to see if the design can perform under pressure. Similarly, 10012K builds their ideas by making prototypes. We run various simulations on our prototypes to finalize our ideas.

FERRARI DAYTONA SP3 PROTOTYPE STAGE

Link to Image

# **10012K**

### BUILDING



### Building Our Robot

### BUILD



In the build phase Ferrari builds their prototypes to meet the essential requirements. While building they also test the cars like 10012K tests their robot. Both Ferrari and our team make adjustments when something isn't working or meeting specifications.

Ferrari racing department workshop

Link to Image

# 10012K

### TEST



### Testing Our Robot

## **TEST AND REFINE**



Testing helps us to make a reliable product. This stage reveal flaws that need adjustments. Ferrari tests their cars on test tracks and in real-world conditions. 10012K tests their robot on the field to fix any defects, as seen on the right.

Ferrari 599 GTB Crash Testing Link to Image

## **10012K**

### IMPROVE



Us (10012K) Improving our Catapult

### FINALIZE



In this phase, 10012K re-tests their robot to ensure it's competition ready with no faults in the design. Ferrari quality checks every single component to guarantee customer satisfaction.

Ferrari KC23 <u>Link to Image</u>

## **10012K** FINALIZE



10012K's Robot

# HOW IS VEX PREPARING US FOR A CAREER IN STEM?

### **Technical Proficiency**

Participation in VEX Robotics equips us with technical skills in areas such as mechanical design, electronics, and programming. VEX provides us with a foundation for STEM careers.

### **Problem-Solving Skills**

VEX encourages students to think critically and to solve problems. It creates a mindset to overcome failures that are needed in STEM fields.

### **Practical Experience**

VEX fosters essential STEM skills, shaping us as future leaders by experience under pressure during tournaments. We get to design, build, and program robots, applying theoretical knowledge in a real-world context, preparing us for challenges.

# THANK YOU FOR WATCHING Sincerely, 10012K



# BIBLIOGRAPHY

<u>What is Stem?</u>

Ferrari Design Process

Why is Ferrari the Best?

VEX Design Process

What is so Amazing about Ferrari?

