VEX VRC – 2023 / 2024

Career Readiness Online Challenge

Team Number - 6008D

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Why Choose Honda?

In 1948, Soichiro Honda founded the Honda Motor Company with Takeo Fujisawa (his business partner) in Hamamatsu, Shizuoka, Japan. Their dream started in a small factory with only 34 workers and has grown to a 58.38 billion dollar company through their ability to provide amazing services at remarkable prices. Undoubtedly, Honda has Honda has made remarkable innovations in the STEM world. Soichiro's perseverance and dedication to making his dream come true has inspired our team to research what it would be like to work at a Honda location, specifically in the Design and Engineering field. To accomplish this, we enlisted the help of William Colwell, a mechanic at our local Honda, Marysville. He will show us what the daily life of a worker at Honda is like, which will hopefully assist us in answering our questions "How is our team similar?" and "What kind of future is VEX preparing us for?".

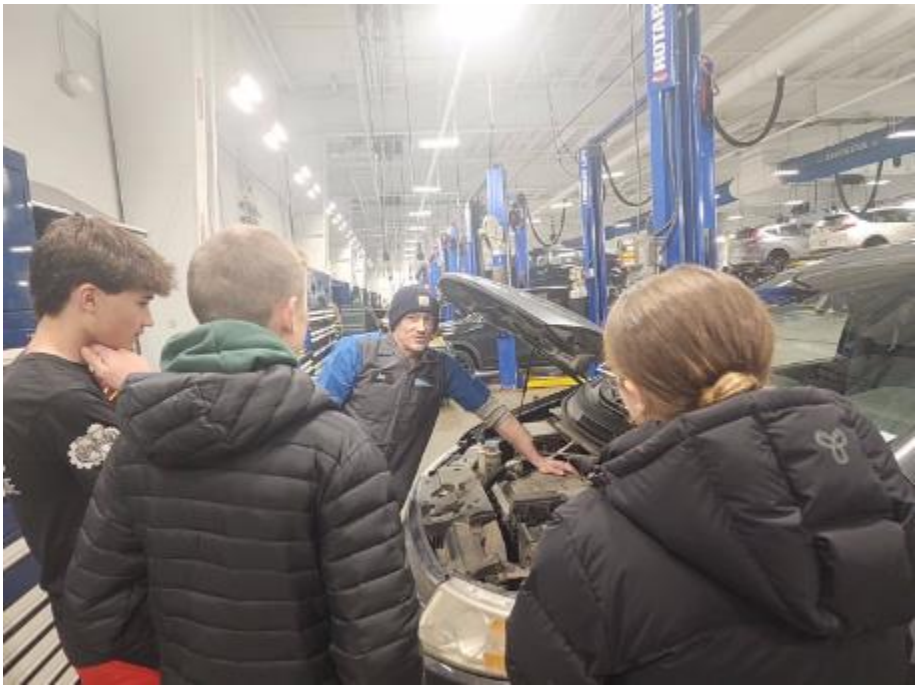

Figure 1 – 6008D meeting with William Colwell

Process Overview

To see the similarities between how our team and the mechanical team at Honda function, we first needed to compare the steps of our Engineering Design Process. This process's purpose is to lay out your ideas and steps of action in an organized way to help complete a goal. Below we have both our design process and a simplified version of Honda's design process. Despite the differences between the titles, the structure of the two processes are similar.

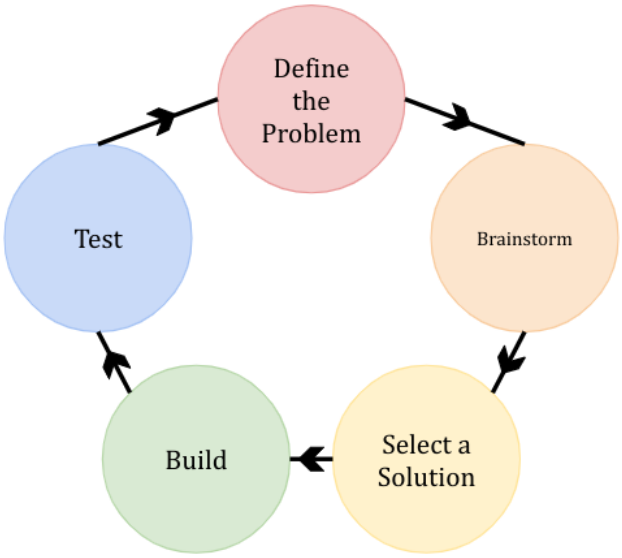

Figure 2 – 6008D Engineering Design Process

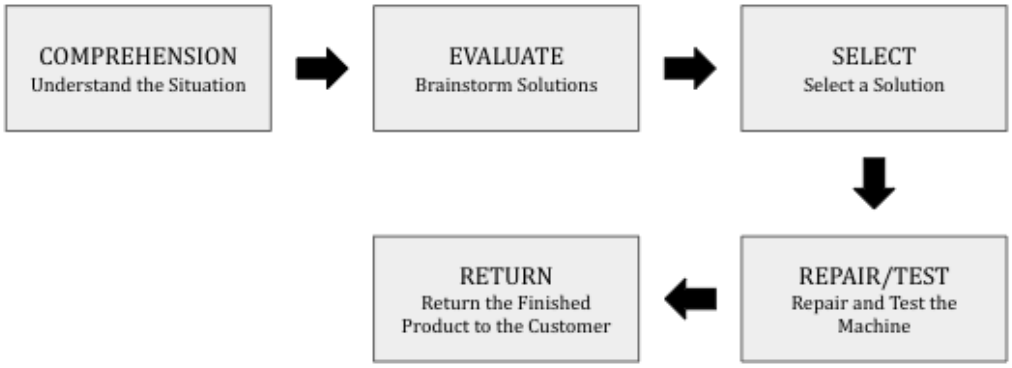

Figure 3 – Simplified Honda Design Process

COMPREHENSION

Understand the Situation

Honda's #1 priority is customer satisfaction. This is prompted by their mission statement, "Maintaining a global viewpoint, we are dedicated to supplying products of the highest quality, yet at a reasonable price for worldwide customer satisfaction." This is why the first step of their process is to comprehend the customer's concerns and the problems with the vehicle. Our team does not have to take consideration from customers when designing our robot, but we do have to have a complete understanding of the situation, like how Honda does.

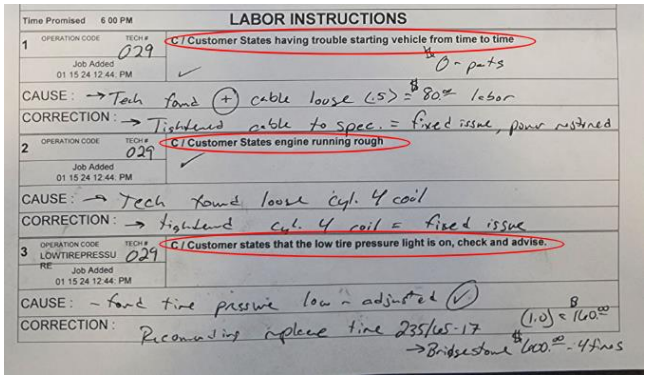

Figure 4 – Customer concerns highlighted on a labor instructions sheet

Figure 5 – William Colwell teaching 6008D about shop safety

EVALUATE

Brainstorm Solutions

This step of the design process is the same for both our team and Honda. We will look through the criteria that we are given and decide the best plan of action based on past education and experiences. However, we write down this information in a design matrix and sketch the designs we plan to implement while mechanics make the decision and record it on their labor instruction sheet (shown in *figure 4*).

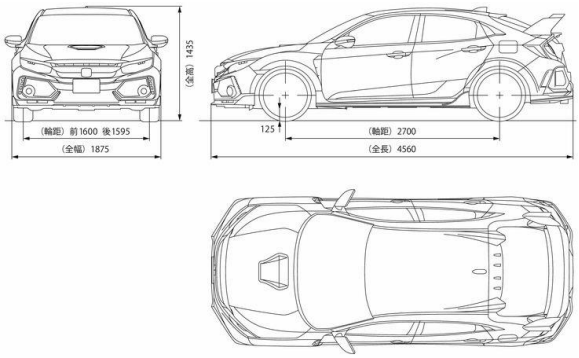

Figure 6 – Honda Civic Type-R Blueprint

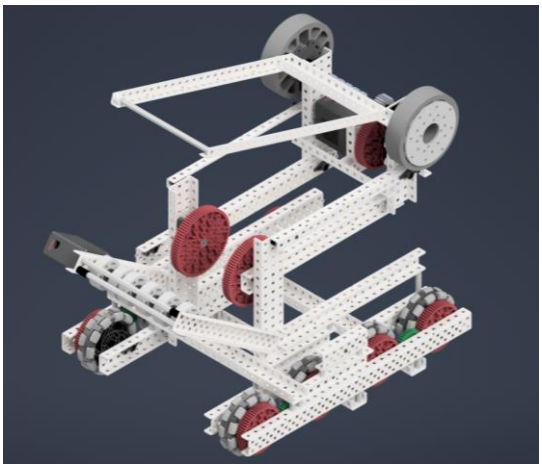

Figure 7 – A CAD Model of our Robot

SELECT

Select a Solution

There are multiple ways to select a solution at Honda, but the one William demonstrated to us was shown on a computer. Using the software IN (interactive network) and the tool DSTI he was able to locate the problem and fix it. We select our solutions through a decision matrix.

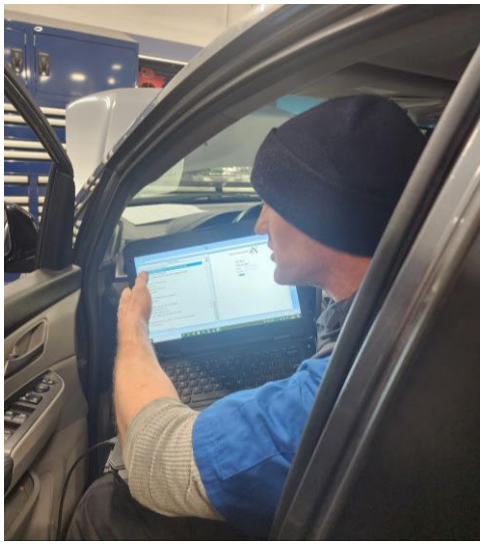

Figure 8 – William explaining the IN software

Key Component:	**I-Value of KP (importance) 10- max 1- min**	6 Motor Linear Omni	5 Motor Linear Omni	4 Motor Holonomic X Drive
Speed	10	8 80	7 70	6 60
Stability	8	7 56	7 56	5 40
Space Consumption	8	6 48	6 48	2 16
Maneuverability	10	9 90	9 90	6 60
	Total:	**264**	**264**	**176**

Figure 9 – The decision matrix we used to decide on our base design

REPAIR/TEST

Repair and Test the Machine

When a part of our robot is not performing as good as it can, we usually end up building a entirely new component. When repairing parts of a car, mechanics do not necessarily have to "build" a new piece, they just fix what is damaged. William and Taylor demonstrate this in *figure 11* below where they tighten a cylinder to assist the engine in running smoother. Once all repairs are done, the mechanic will usually take the car for a test drive to make sure that everything is functioning correctly. We test our designs by running it through 10 trials to make sure that the component is functioning consistently and correctly.

Figure 10 – Taylor and William tightening a cylinder

Rotations Trials			
Measured in: Seconds			
	Holonomic X Drive	**6 Motor Linear Omni Drive**	**5 Motor Linear Omni Drive**
Trial 1	125.22	84.1	91.53
Trial 2	125.11	83.65	92.43
Trial 3	125.23	83.67	91.34
Trial 4	125.75	84	91.23
Trial 5	125.61	84.21	91.82
Trial 6	125.32	80.95	91.03
Trial 7	125.7	83.87	92.4
Trial 8	125.34	83.56	90
Trial 9	124.58	82.34	92.3
Trial 10	125.83	80.34	91.62
Average:	125.369	83.069	91.57

Figure 11 – Our team's rotation testing

RETURN

Return the Finished Product to the Customer

Once all the repairs and phases of testing are completed, the car is returned to the owner with a report of any changes that were made and the cost of repairs. Our team takes our finished robot to competitions to show that it is functioning correctly. We create a bill of materials that show the total cost of the materials used. Both steps show that the finished product is working as intended and a list of expenses.

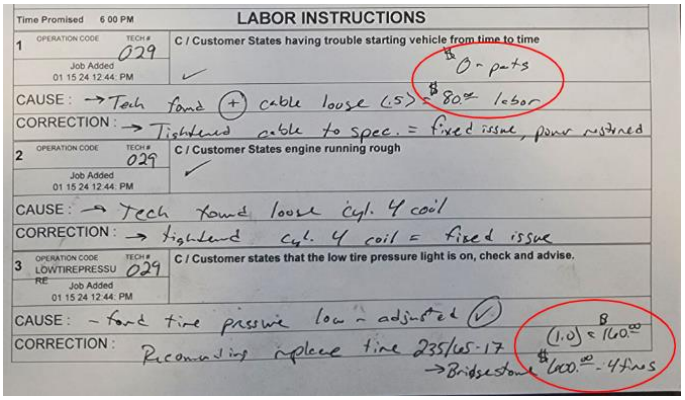

Figure 12 – Expenses made during the repairs William does on the vehicle

Figure 13 – 6008D at the RiverBots Signature Event with the Design Award

Conclusions/Lessons Learned

This experience allowed our team to make many connections between robotics and mechanical engineering. One of these connections is simply how we think. Our thoughts are directed towards trying to figure out a solution and work to our best ability. This way of thinking becomes more crucial as you mature, meaning VEX not only helps us prepare for future careers, but also for the rest of our lives. We can also make connections between work documentation, CAD, design sketching, and working with materials. Robotics teaches us to work with both our hands and our minds, helping to prepare us for almost any occupation field.

One skill that is taught in VEX that expands past career readiness is the ability to build bonds with those around us. Communication is taught through interviews and alliances that take part during robotics competitions. This ability enables us to grow as individuals and develop strong relationships with those we surround ourselves with, as well as develop a deeper understanding of the world around us. The ability to convey our ideas to others eliminates conflict and helps to create a positive atmosphere. Our time in VEX has equipped us to lead STEM fields in the future and serve as role models to those who need it.

Figure 14 – 6008D and William Colwell (Missing from Image: Carter Hartings)

References

Why Choose Honda?

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Process Overview

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Select a Solution

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