

VDR3 Report

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Current State of Design

The team has completed the design of the hydraulic diagrams, which outline the different drive modes to be utilized in the three races. These diagrams have been finalized in CAD and sent to IFP Motion Solutions for fabrication and delivery. The vehicle frame has been submitted to Dr. McConomy for ordering. Calculations were performed to determine the optimal pump and motor sizes, ensuring that the rider would need to exert minimal force to pedal effectively. The team has placed orders with IFP Motion Solutions and SunSource for all required parts from the NFPA parts list, including the accumulator, manifold, motor, and valves. Once these parts are received, the team will order any remaining necessary items. Upon receiving all components, assembly of the vehicle will begin. Additionally, the team plans to create a prototype to visualize and plan the arrangement of the vehicle's components. This step will help refine the design and ensure all elements fit as intended.

Future Work

In the near future, the team needs to assemble all the hydraulic components that have been ordered. This includes ordering the necessary hoses to connect all the hydraulic components. The hoses must meet specific sizing requirements and be rated for at least 3000 psi to ensure a sufficient safety factor. Additionally, the team must source appropriate fittings to connect the hoses to the manifold, an essential step in assembling the hydraulic system.

The team also needs to assemble the electronic system, which consists of the electronic pressure transducer, touchscreen display, solenoid valves, and the MC-2-18 PLC microcontroller. The display must be configured to show the pressure readings from the transducers and indicate the vehicle's current mode based on the data output by the MC-2-18 controller, including which solenoid valves are open or closed.

Once all systems are assembled and independently tested to ensure proper functionality, the next major task will be integrating these systems. The electronic system must be capable of changing the hydraulic system's mode by activating or deactivating the appropriate solenoids, effectively defining the vehicle's operational mode.

Additionally, the team must prepare a 45-minute midway review presentation detailing the progress made up to that point. After the presentation is reviewed, the team will shift their focus toward completing a fully finished product by April 10th, in preparation for the competition scheduled for April 23–25. The vehicle must undergo thorough testing to ensure it meets all competition requirements and avoids any risk of disqualification.

Expected Challenges

As the team progresses, several challenges are anticipated. These include learning how to use the PLC and its integrated development environment (IDE) to control the solenoids, as well as designing and integrating a reliable connection or coupling between the pedals and pump, and between the motor and rear drive wheels. Another significant challenge will be devising effective methods to test the system, measure critical performance data, and use the test results to refine and improve the system.

Additionally, the team must create a 45-minute presentation for the midway review. While gathering sufficient information may not be difficult, presenting it in a way that is engaging and avoids monotony will be a notable challenge. Finally, designing the bike to be easily disassembled for shipment and reassembled at the competition is another hurdle the team must address. These challenges will require careful planning, collaboration, and innovative problem-solving to overcome.