Microgravity Press Washing Machine Development Log

05/08/23

Today I would call my official start up of the project again. I’ve had to shelve this project due to schoolwork and my activity in the various clubs I am in at school, but now with the semester over and me having moved up to my job for the Summer, it seems like a good time to start up again. I would like to work on this at least daily, getting something opened for the design.

05/09/23

Today I am recording an update to the design. I found that I could save on vertical space to maximize piston travel by moving the load cell assembly, so it is no longer directly in line with the piston head. The lead screws driving the piston extend to the lower assembly, and are not in line with the piston, so by putting the load cells at the thrust bearings, the same load can be measured. Additionally, the load cells can be used to measure the force application of each lead screw, helping for troubleshooting, diagnostics, and alignment on assembly. Smaller load cells can be used since multiple would be taking the brunt of the load as opposed to one. This does leave a potential disadvantage of only being able to sense load in the thrust direction since the current design is to use two thrust bearings at opposite ends of the screw such that the lead screw is only ever in tension. Without adding additional load cells, knowing the force application cannot be accomplished with the current bearing set up. Since the brunt of the force is only experienced while the piston is compressing the clothing, the possibility of the lead screw only being supported by thrust bearings at one end of the assembly could be explored, allowing for force application to be read with one load cell.

05/11/23

Today I reached out to Dr. Gold and Glenn Johnson to kickstart the project again.

05/12/23

Today I made a free body diagram for the drive train system to define force application and required lead screw sizes. From here I plan to spec out load cell sizes to attach to the lead screws. From here I plan to get a torque rating to inform the design for the frame and pick out a gearing box and other components for the drive train.

05/13/23

Today I started work inputting some of the work I’ve done to the documents which are being displayed on GitHub. I plan to streamline this system so I work directly from these documents, so I also did work to make them readable as documentation and organized, which will help tremendously in the design process. I also wrote a design process strategy which will be used to map out how known values are used to derive design aspects of various components and subassemblies. I also found some documentation for the basic problem and design overview that I wrote during the Fall 2022-2023 semester, so I added it to the repository. Other previous work being reimplemented is the powerpoint document being used to detail the wash process.

05/18/23

Today I worked on a slideshow presentation and continued work on an updated P&ID (piping and instrumentation diagram) to present to my initial NASA HUNCH supervisors. I am hoping to get some contacts who would be willing to discuss this idea with me and help to further the design.

05/19/23

Today I had my meeting with Dr. Gold over Microsoft teams. Glenn was unable to attend the meeting, so we will be having a meeting later the following week.

05/20/23

Today I started setting up the raspberry pi to begin working on and learning the programming portion of the project. I plan to set up the github repository so that it can be accessed by the Raspberry Pi, allowing the code created on it to be saved to the repository as well. I also moved the old files from the washing machine into a new repository, making it so that it is less resource intensive for those viewing to download the repository, and also to make using the repository more usable with the raspberry pi. I also sent an email to Glenn Johnson with some of the contents of the repository attached so we could try an organize another meeting before I have to leave for school.

06/13/23

First return to work since the start of Summer Sea Term. Likely few updates will be made before the end of sea term due to the workload associated with the semester. Today I outlined potential pseudocode which would utilize lists in a for loop to define state conditions such as sensing criteria to move to the next wash state, actuator and valve conditions, and sensing conditions which would prompt a halt in operation for a given part of the wash cycle. Through this method, wash processes can be made from data structures with varying length and tailored to various clothing types and extent of cleaning required. Additionally, changing and saving a wash cycle for later use is made relatively easy by this process.