Innovative Hydram

Team Hydraulic Hitters

Dan Inocencio, David Orozco Gamez, Cameron Sacks, Christian Solorzano

Sponsor: Dr Asfaw Beyene

The Hydraulic Hitters

Project Goal

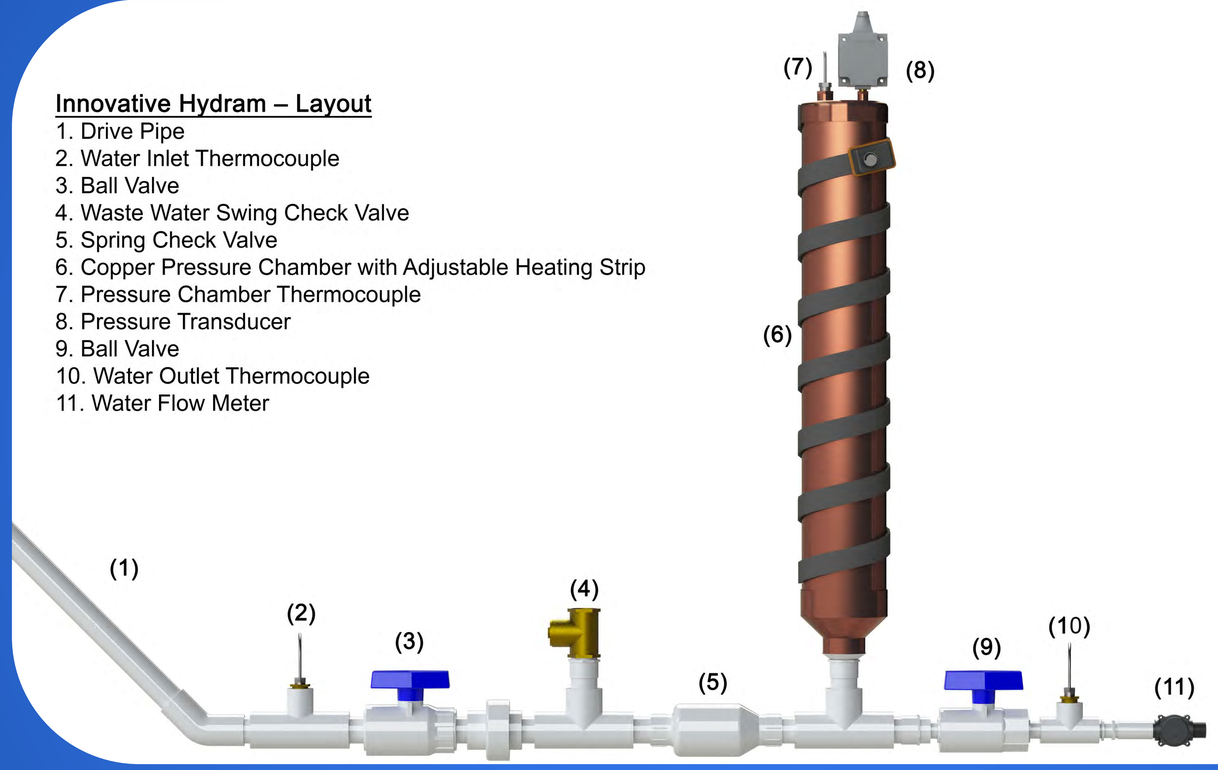
Create a Hydram that incorporates thermal infusion into the Pressure Chamber in order to increase overall efficiency of the pump. The parameters that will be observed to check the efficiency are pressure and outlet water flow rate.

Background

The hydraulic ram pump, also known as hydram, is a water-lifting device that does not need the use of an external power source. It utilizes the kinetic energy in a moving column of water to raise part of that water to a higher elevation. The physics is based on the water hammer theory. The water hammer effect is recognized as a harmful and disruptive phenomenon. It has the potential to rupture pipes and damage surrounding systems when it occurs. This project will utilize the water hammer effect as well as other improvements to convert this disastrous outcome to an alternative method of pumping water.

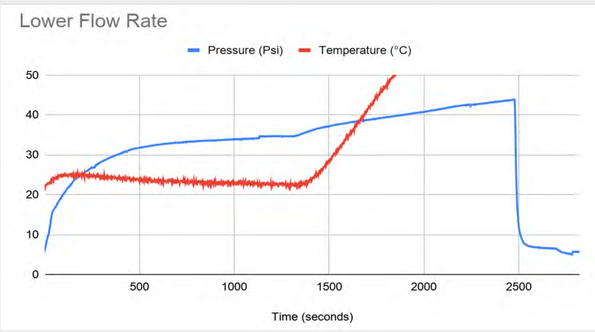
Innovative Hydram – Layout

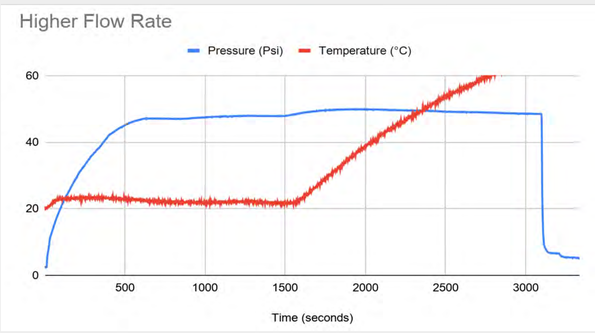
1. Drive Pipe
2. Water Inlet Thermocouple
3. Ball Valve
4. Waste Water Swing Check Valve
5. Spring Check Valve
6. Copper Pressure Chamber with Adjustable Heating Strip
7. Pressure Chamber Thermocouple
8. Pressure Transducer
9. Ball Valve
10. Water Outlet Thermocouple
11. Water Flow Meter



Testing/Analysis

- During testing, it was found that having different inlet flow rates impacted the pressure differently.
- At the lower inlet flow rate, the max pressure was approximately 34 psi. After introducing heat, the pressure increased by 9 psi.
- In comparison, at the higher inlet flow rate, the max pressure was approximately 47 psi. After heat was introduced, it only rose about 2 psi.
- Demonstrating that a lower inlet flow rate will increase the influence that temperature has in the pressure chamber.





Manufacturing

Materials:
- PVC Schedule 40
- Copper Type L

Connection Type:
- PVC Cement
- Brazing

Dimensions:
- Length: 42”
- Height: 29”

PVC Tee for Pressure Chamber

Bottom of Pressure Chamber

Top of Pressure Chamber

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