

In-Pipe Hydropower



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Area of Opportunity

There is an increasing need for renewable energy due to factors such as global warming and an increasing demand for energy independence. To support this effort, this project explored the feasibility of in-pipe hydropower.

Solution

By using water turbines in place of pressure valves we can turn currently wasted energy into electricity. This project studied the effectiveness of an in-pipe turbine to act as a pressure-reducing valve in between a high-pressure water source and lower-pressure potable water.

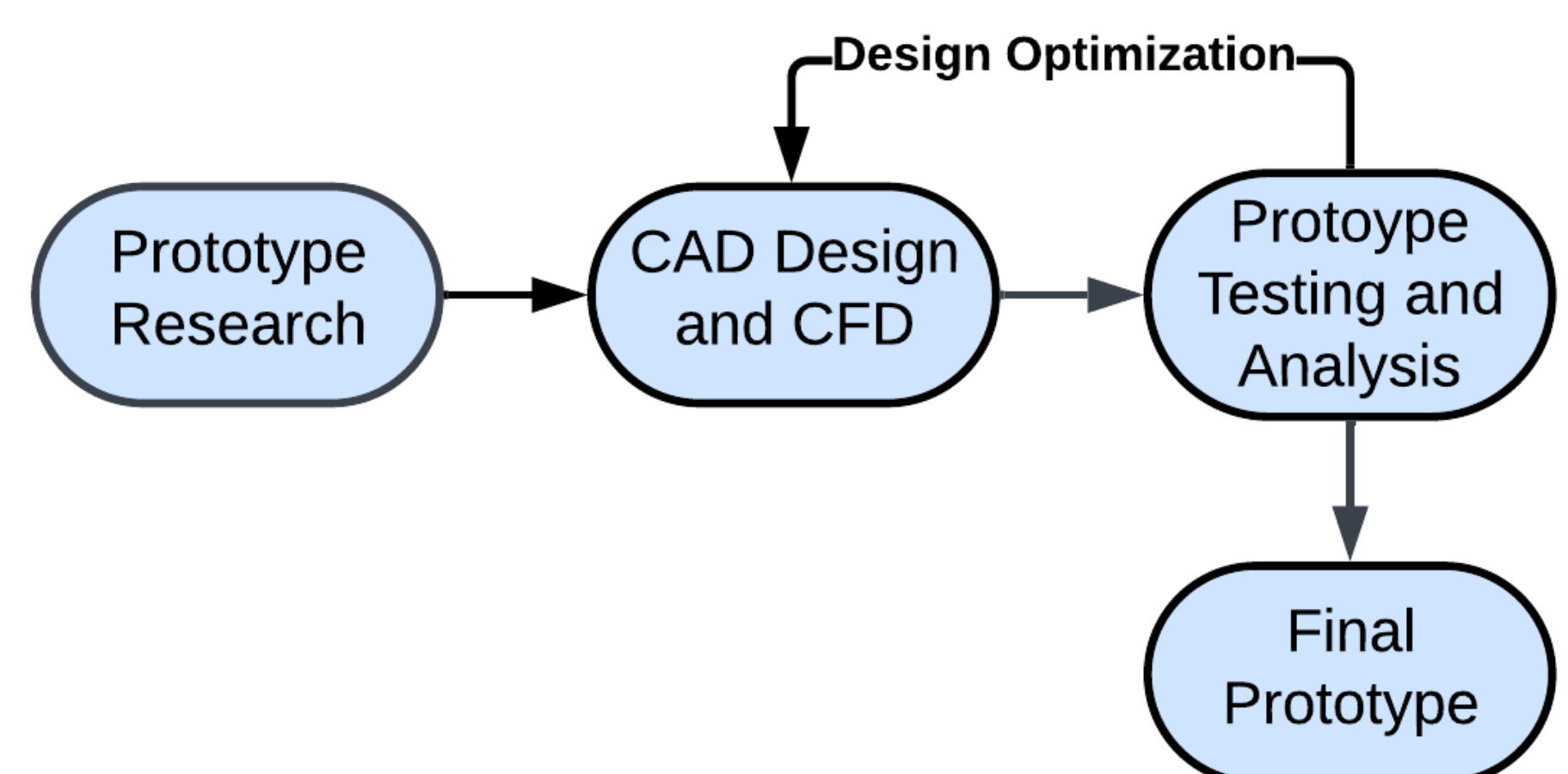
Methodology

- Prototype Research: Patent review and plumbing system analysis.
- CAD Design and CFD: SolidWorks was used to design a Pelton turbine as well as a casing
- Prototype Testing and Analysis/Design Optimization: This involved going through several iterations of prototypes to optimize power output
- Final Prototype: A system was constructed using a water pump to supply high-pressure water to our turbine which would power a DC generator.

Results/Future Direction

- The system was able to produce 20.0V - 20.8V consistently and power a 12V light bulb.
- Pressure was reduced from 60 psi.
- The scale of this system would be more suitably placed to capture power after a pressure-reducing valve.
- Future research with a more realistic high-pressure water source as well as different turbine configurations should be conducted to optimize cost efficiency with power output.

PROOF OF CONCEPT/ EXPERIMENT/SIMULATION



Community Benefit

- Equitable Access to Clean Energy: By utilizing municipal water systems, this technology can provide renewable energy solutions even in underserved or low-income areas.
- Reducing Energy Costs: Lowering costs by generating supplemental power locally,.
- Sustainability: Capturing otherwise wasted energy to cut ghg emissions.
- Infrastructure Resilience: The ability to retrofit existing infrastructure to increase energy independence.

Center for Sustainability

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