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College of Engineering

PureFlow

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Studio G

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Mission

Objective:

- Develop a portable, efficient, and user-friendly water desalination device.
- Tailor the device for lightweight travel and deployment in remote regions.
- Produce **five gallons per hour** of purified water utilizing a **100-psi** membrane

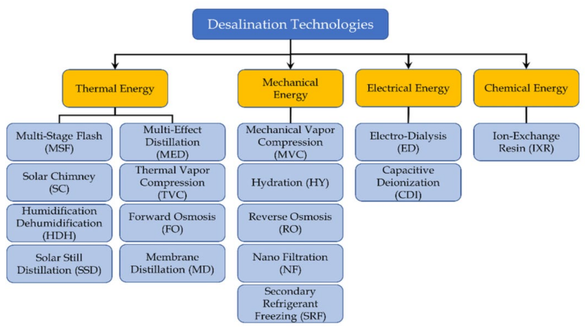
Purpose:

- Address the urgent problem of water scarcity in remote, drought-affected areas.
- Focus on underdeveloped communities with limited water resources
- Provide a solution for disaster relief operations where access to clean water is critical.

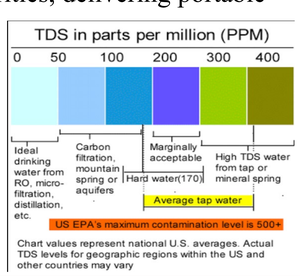
PureFlow:
Your Solution for Pure & Refreshing Water!

Research

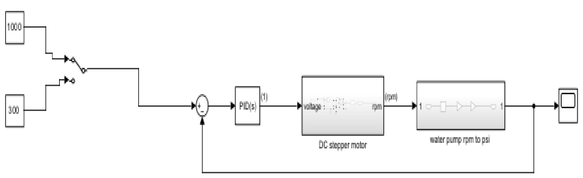
Identifying key issues and potential solutions was critical, focusing on customer needs, market competitors, desalination methods, components and elements, and deliverables to effectively guide the design and development process.



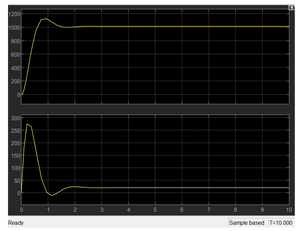
Reverse osmosis (RO) was discovered to be the most effective desalination method for a portable desalination system. RO employs a semi-permeable membrane to remove salt and other impurities, delivering portable water with high efficiency.



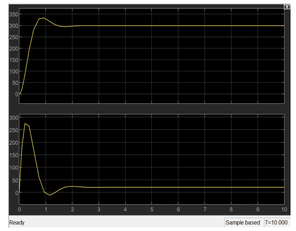
Final Design



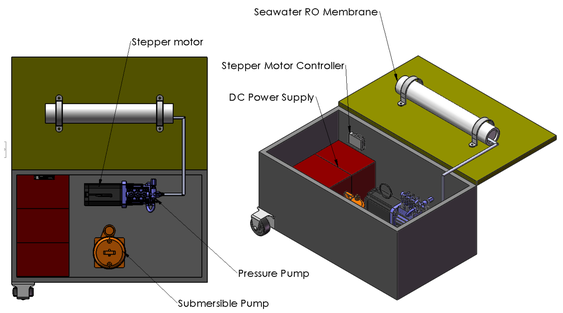
PID controller

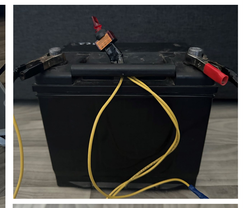


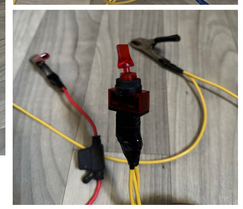
1000 Psi for saltwater



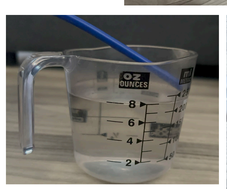
300 Psi for fracking water







Water Type	Clean water produced (oz)	Time (s)	Time per gallon (min)	Gallons per hour GPH
Rio Grande Water 1	8.5	96	24	2.5
Sugar Water	10	136	29	2
Saltwater 1	N/A	60	N/A	N/A
Fresh Water	8	107	28.5	2
Rio Grande Water 2	8	87	23.2	2.5
Saltwater 2	4	312	166.4	0.36



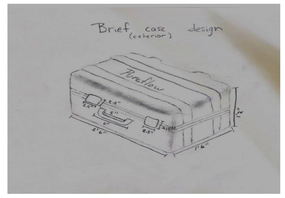
Design and Operation:

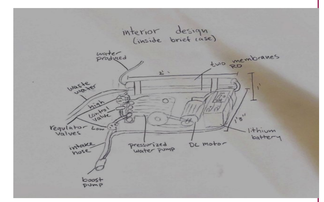
The system is powered by a 24-volt, 60 amp-hour battery, which supplies energy to a PID controller—the central control unit for the device. The PID controller manages system operations, regulating a stepper motor to adjust its RPM and torque precisely for optimal performance. Additionally, the controller operates a booster pump, which controls the flow of water entering the system. Water flows from the booster pump to a pressurizing pump that elevates the pressure to the level required for desalination. It then moves into the main housing unit, where it passes through a pressure release valve and a PSI monitor displaying real-time pressure levels. The pressurized water is directed into the reverse osmosis (RO) membrane, where desalination takes place. High pressure forces the water through layers of a semi-permeable membrane, filtering out impurities while allowing purified water to pass through. The purified water is collected in a central channel, while wastewater is diverted out of the system. This efficient process achieves a production rate of five gallons of purified water per hour, meeting our target for clean water output.

Concept Development

Initial Concept:

- A compact design integrates all components within a casing, featuring a lithium battery that powers a DC motor. This motor drives a pulley system that activates the water pump and pressurizes the water to a desired psi of 800.
- L30in x W18in x H14in suitcase
- 12V feeder pump
- 12 V step motor
- 2 RO membrane
- 12V battery
- 1000 psi plunger pump
- Hose housing



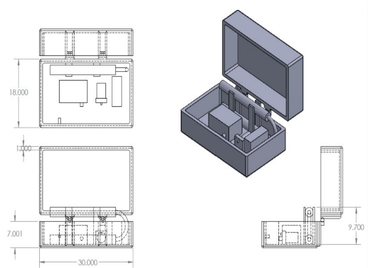


Performance

- **Motivation for Modification:**

This initial concept was too large and heavy, making it impractical. Additionally, it is costly and poses significant safety risks, particularly related to the pressure involved.

Proof of Concept:



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