

Preventing the Spread of Invasive Species via Boating Infrastructure

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**BEYOND
ATTITUDE**

Project Scope

Non-native aquatic invasive species introduced into a new area:

- Disrupt the local ecosystem¹
- Have a negative effect on the plants and animals that live there¹
- Spread unintentionally when a boat is moved between bodies of water¹

Zebra Mussels



Milfoil



Quagga Mussels



Boaters need to clean, drain, and dry their boats when they move from water with invasive species, to a non-infested body of water.

- 6 % of boaters launch their boats in different bodies of water on the same day²
- 54 % use their boats in different bodies of water, but not on the same day²

The scope of this project is to design infrastructure that could be installed at boat landing sites throughout North America that would allow boat users to clean, drain, and dry their boats when they take them out of the water.

Requirements

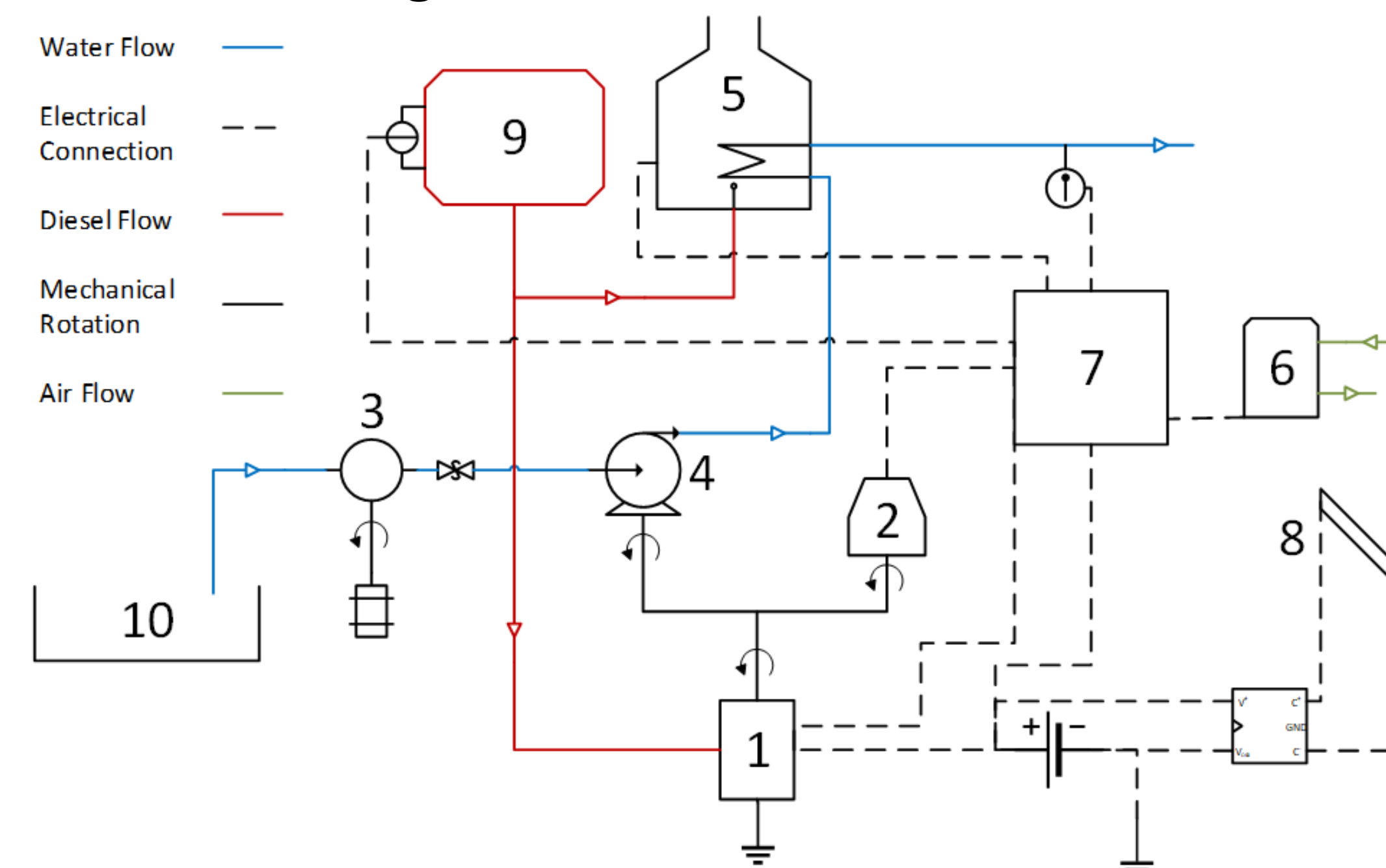
The ideal design shall incorporate the following requirements:

- Minimum water temperature: 60 °C
- Water pressure range: 1800-3000 psi
- Hot pressurized water must remain on infected area for a minimum of 10 seconds
- Location of station: within 50 meters of shoreline
- Required tool height: 0.9 ± 0.2 m
- Reach length of tools: 15 m
- Boaters must be able to understand how to use the station in 5 minutes or less
- To prevent theft, tools and equipment shall be secured to station



Design

Diagram of ideal design:



The system contains the following components:

1. Diesel Engine
2. Generator Head
3. Low Pressure Water Pump
4. High Pressure Water Pump
5. Diesel Coil Heater
6. Wet-Dry Vacuum
7. Control Panel
8. Solar Panels
9. Diesel Fuel Tank
10. Water Source/Lake

Verification

A prototype was constructed using available materials, as budget constraints restricted the purchase of ideal materials. The prototype was used to verify that all of the requirements could be met.

Stage 1: Housing



Stage 2: Equipment & Electrical



Stage 3: Aesthetics



Stage 4: Testing



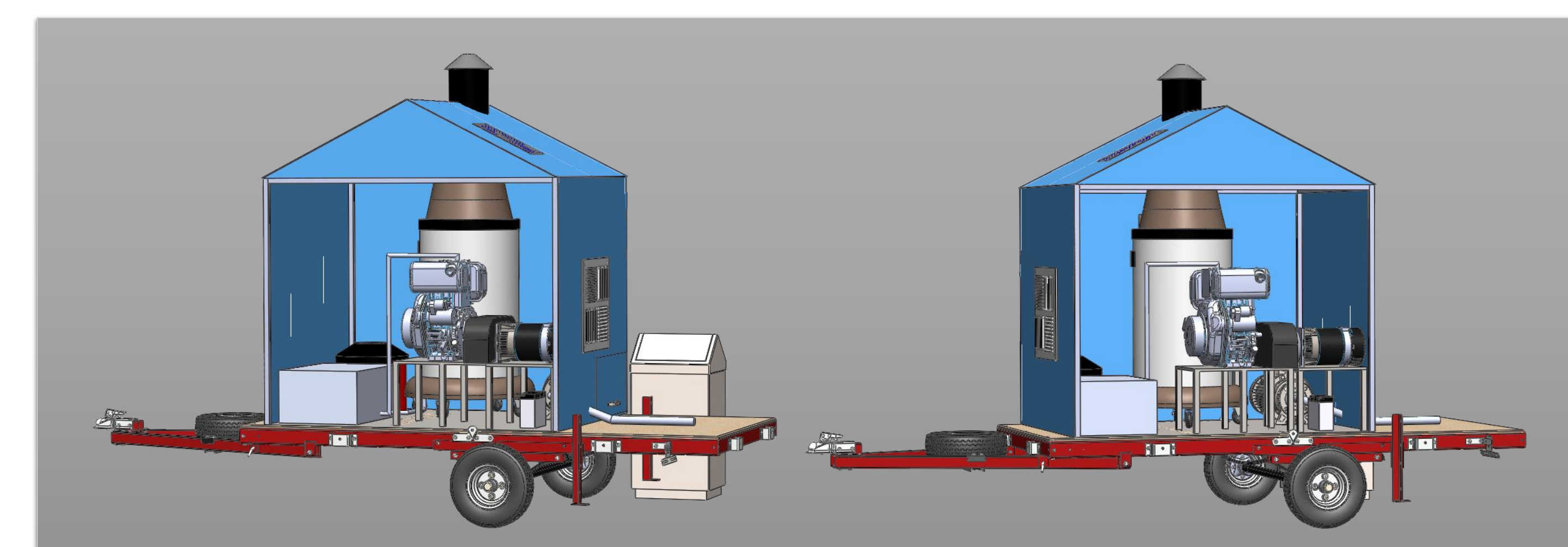
Results

Requirement	Achieved	Pass/Fail
Water Temperature (T)	70.7 °C	✓
Water Pressure (P)	2500 psi	✓
Required Tool Height	0.85 m	✓
Tool Reach Length	4 – 10 m	✗
Comprehension Time	3 minutes	✓

- Location of system and minimum exposure time requirements depend on the user and could not be verified during testing.
- Tools included in the final design need to be properly secured, this was not tested on the prototype.

Conclusion

Using the results obtained from prototype construction and testing, the final ideal design was developed:



Before producing the system in mass quantities, it is recommended to build one iteration of the design and perform testing, as was done with the prototype. Budget constraints prevented the final design from being constructed initially.

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References

1. National Ocean Service. (2018). *What is an Invasive Species?* Retrieved from <https://oceanservice.noaa.gov/facts/invasive.html>
2. Canadian Council on Invasive Species. (2018, March 31). *National Invasive Species Recreational Pathways Survey – Results and Reports*. Retrieved from http://canadainvasives.ca/documents/2018_07_National_Invasive_Species_Recreational_Pathways_Survey_FINAL.pdf