

Homer Tidal Turbine and Marine Instrument Test Station Design

Spring 2013 Senior Design Project

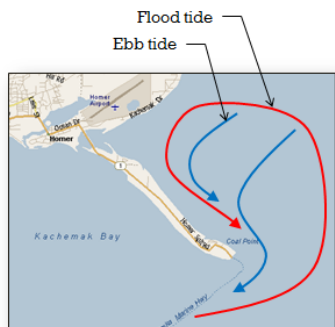
Purpose of this project

- Provide manufacturers and marine agencies a venue for testing tidal power turbines and marine instruments
- Determine the feasibility of building and implementing tidal power turbines as power sources in the Kachemak Bay



Project Scope

- Provide the client, the City of Homer, with a design for a Tidal Power and Marine Instrument Test Station, and
 - Develop design alternatives,
 - Deliver engineering documents
 - Offer recommendations



Dock-Mounted Alternative

Advantages

- Revenue
- Interconnection compatibility
- Increased range of generators that could be tested
- Available electric power
- Enclosure options
- Available structure
- Client preferred
- Long-term site monitoring

Disadvantages

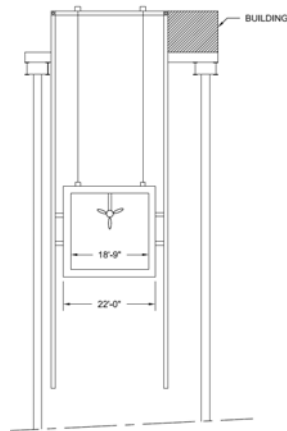
- Moderate and unidirectional current
- Higher freeboard
- Maintenance of deployed ocean sensors

Preferred Alternative

Dock-Mounted Alternative

Turbine assumptions

- Max width = 10ft
- Max height = 10ft
- Max length = 10ft
- Max weight = 30 kips



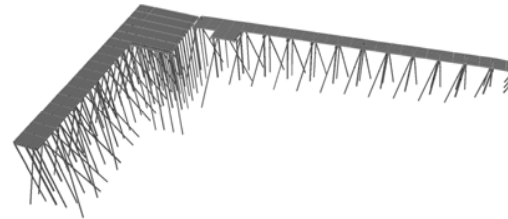
Floating Alternative

Advantages

- Transportation
- Instrumentation access
- Access to higher currents
- Access to different environments

Disadvantages

- Generator system required
- Anchoring system
- Data collection
- Long term testing



The SAP2000 model of the deep water dock indicated that dock design loads are greater than the potential additional load for the test station.



Environmental Monitoring

- Water velocity – the overall movement of the water
- Water depth at the test site
- Water temperature
- Water conductivity - used to determine water salinity
- Water turbidity – the cloudiness of the water
- Size of particulates suspended in the water
- Scouring of the seafloor beneath the hydrokinetic device
- Noise produced by the hydrokinetic device
- Cetacean activity near the test site
- Other wildlife activity near the test site
- Capability to extract water samples for further laboratory testing

Conclusion

The Deep Water Dock at the City of Homer is an ideal location for a tidal turbine and marine instrumentation test station.

Recommendations

- Complete site characterization
- Biological activity monitoring
- Full site and structural inspection
- Detailed cost estimate

Acknowledgements

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- UAA School of Engineering
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