

Research and Development for Cost Savings and Commercial Scale OTEC

Heat Exchanger

- Enhanced heat transfer (increasing Surface area, turbulence, mixing, validated performance)
 1. **Enhancement without pressure drop**
- Material (aluminum alloys, plastics, *low cost* titanium)
 1. Greater extraction processes
 2. Qualification (lifetime, account for material losses) of Aluminum Alloys
 3. Plastic: High thermal conductivity, high performance, low cost and lightweight
- Fabrication techniques (bonding, brazing, welding, extrusion, etc.)
 1. Qualifying (corrosion, fatigue) fabrication techniques for HX validating under conditions of use
 2. Improved bonding of plastics
 3. High precision extrusion process for Aluminum used in compact HX

Power Cable

- Development of dynamic cable greater than 30 MW
 1. Cables that can stand up to repetitive bending and have more dielectric capabilities
 2. Could be covered by oil industry JIP and DOE project, nanotechnology project at Rice University
 3. Lighter armoring and conductor materials

Cold Water Pipe

- Improve cost effectiveness of materials/equipment
 1. Soft cold-water pipes with bottom mounted pumps
- Full demonstration of pipe production, delivery and installation

Pumps and Turbines

- Low pressure steam for open cycle (Lower Cost)
- Lower cost Compressors for maintaining vacuum (centrifugal)
- Condition-Based maintenance sensing and turbine performance optimization
- Condition-based maintenance sensing for pumps

Platform Moorings

- Investigate/be flexible to new paradigms and designs relevant to OTEC needs
 - Optimization for OTEC
 - Improving overall platform system for OTEC
- Investigate effective anchoring systems in volcanic rock
- Investigate techniques that require minimal equipment for mooring & power cable installation
- Investigate effective mooring systems on high slope bottoms
- Adapt codes and standards to reflect OTEC systems

Platform/Pipe Interface

- Develop low cost Buoyancy
 - Materials and fabrication validation
 - System wearing
 - Does technology today provide us acceptable risk?
- Analytical simulation specific to OTEC
- Find and Adapt Existing Technologies and Analysis Tools to:
 - Structural Analysis
 - Structural Simulation
- Modeling failure mode

Platform

- Low cost manufacturing techniques
 - Lower Labor and Materials Cost
 - American Competitiveness
 - Quality Control
- Developing OTEC standards based on cost/risk
 - Safety of crew in the event of failure or leak of working fluid

General:

- Large scale testing of subsystems
- Trade off studies need to be performed relative to the location of water production (onshore vs. offshore) (water production)
- Compile standards from other industries and adapt to OTEC