Methane Hydrate Combustion

**Project Advisors:**
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**Customer:**
Navid Saeidi

**Team Leads:**
Patricia Martinez
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**Resources:**
W.M. Keck Foundation Deep-Ocean Laboratory
Robinson Ramos

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- **Methane Hydrates** are molecules of methane (CH4) bound within a crystal lattice of ice (H2O) created under high pressure & low temperature.
- Little is known about Methane Hydrate’s natural state including its properties combustion characteristics.
- Methane hydrates have been discovered in marine sediments and under shallow permafrost deposits in arctic regions where these conditions are ideal.
- University of Texas estimate total Methane Hydrate in the world would supply ~250 years worth of natural gas.
- Research Labs around the world are studying various methods of extraction.
- W.M. Keck Foundation Deep-Ocean Laboratory is studying Methane Hydrate combustion and burning characteristics but requires a facility with ideal conditions to obtain accurate results.

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**Team Members:**
Michael Hu
Manuel Cardoso

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**Resources:**
- W.M. Keck Foundation Deep-Ocean Laboratory
- Methane hydrate combustion and burning characteristics

**Design Specifications and Parameters determined**
- Simulations made
- Materials and equipment selected

**Fall**

- Design specifications and parameters determined
- Simulations made
- Materials and equipment selected

**Winter**

- Facility manufactured and fabricated by the end of winter quarter
- Testing of facility through Methane Hydrate Combustion

**Spring**

- Testing of facility through Methane Hydrate Combustion
- Prototype ready to present

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**Winter 2019 Budget**

- Systems: 2.1%
- Emissions: 4.3%
- Mass Loss: 44.7%
- Airflow: 48.9%

Note: Most of the necessary material can be found in the W.M Keck Foundation Deep Ocean Science Library, thus the budget is dedicated to replacements of existing instruments.

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**Winter 2019 Progress**

- Formal design with dimensioned Solidworks models
- Down selection of equipment needed to build entire combustion chamber.

**Complete**

- Fabrication of combustion facility by combining and integrating airflow system, emissions system, and mass loss system.

**In Progress 75%**

- Testing airflow in the combustion chamber to validate one air inlet as most optimal option for emissions readings
- Identifying design problems and initiating plan of action for design modification in spring 2019

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**Methane Combustion**

Manuel Cardoso with Methane Hydrate