Stirling Cryocooler

PRELIMINARY PRESENTATION

DESIGN TEAM 1

-ABDULRAHMAN ALAZEMI

-FAIEZ ALAZMI

-LUIS GARDETTO

-AHMAD ALTHOMALI

-JOHN WILEY

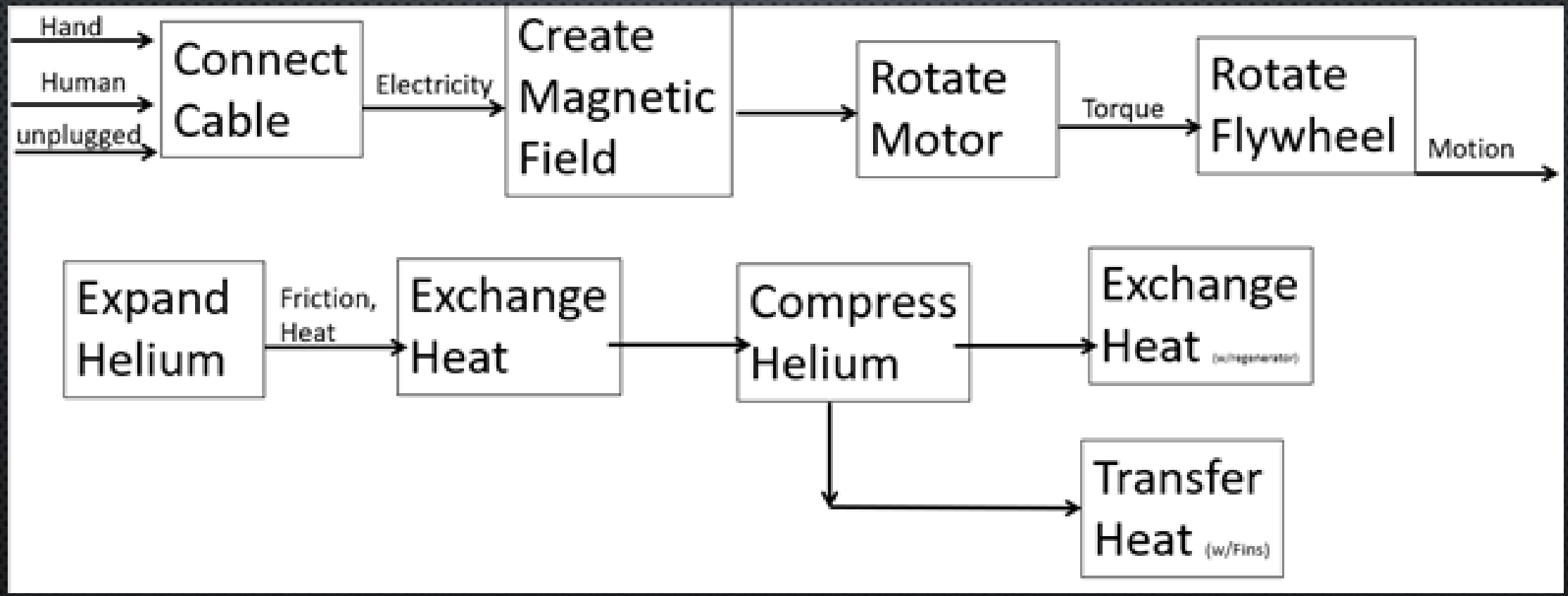
Project Description

- Design and build a bench top device that demonstrates refrigeration processes using the Stirling cycle.
- Stirling Cryocooler: putting in power to remove heat.
- Model will be used as a working test device in Experimental Methods Laboratory.
- Allows students to further conceptualize processes such as isothermal compression and expansion. It also will serve as an example of a truly closed system.
- Sponsor/Client Dr. David Trevas.

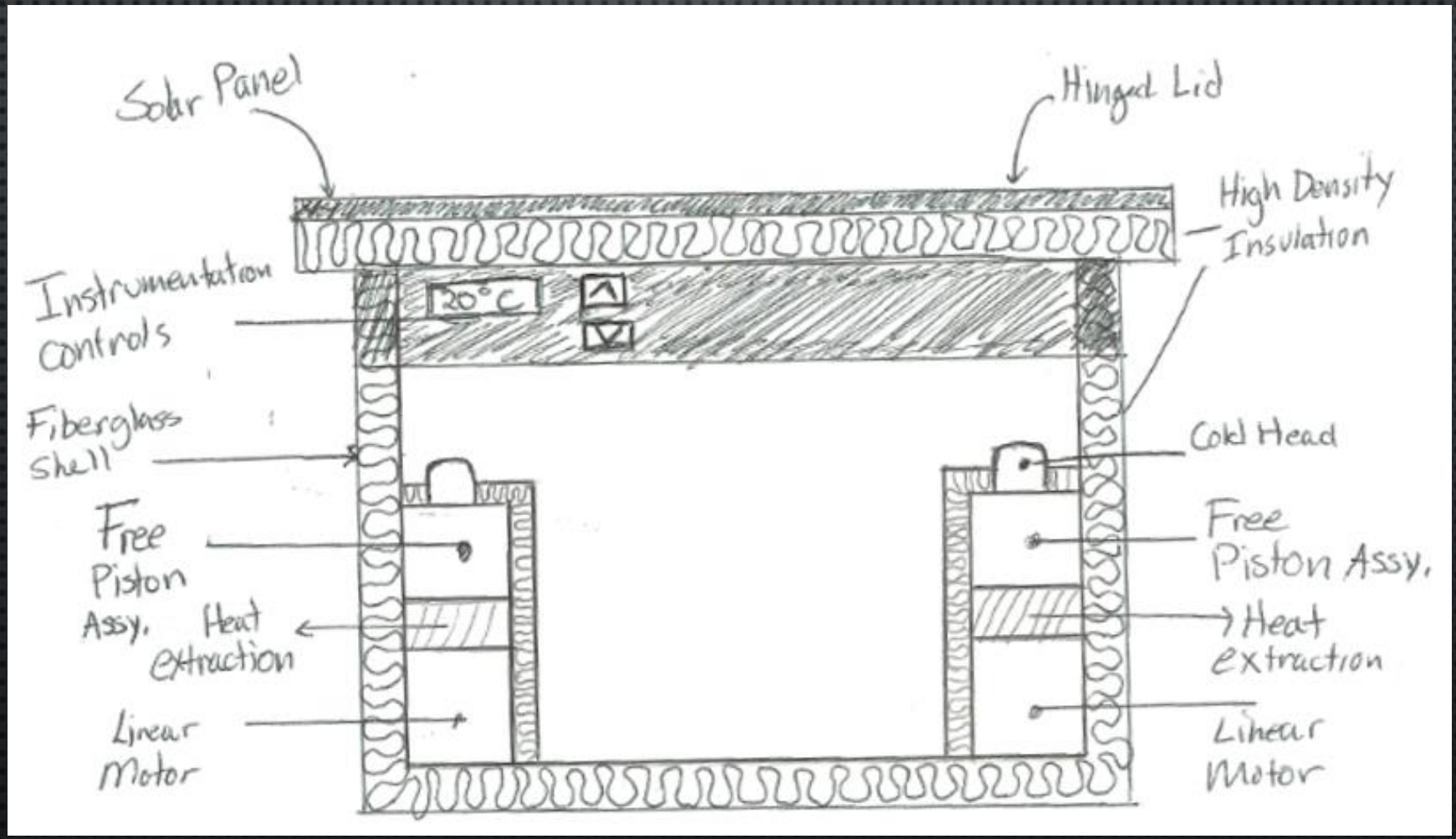
Presenter: Ahmad Althomali

Black Box Model

Functional Model



Stirling Cooler #1 Sketch



Presenter: John Wiley
7/12/2018 Stirling Cooler #1

DESIGNS CONSIDERED 1

$245

Reverse engineering opportunity

Key Features:

Single piston Stirling engine tested to run continuously for more than three years

Holds temperatures at 4 degrees C +/-2 degrees

Locking lid

Runs on 40 watts of electricity, less than the average household light bulb

Heats and cools making it the ideal year round solution

Releases no CFCs, harmful refrigerants, or pollutants

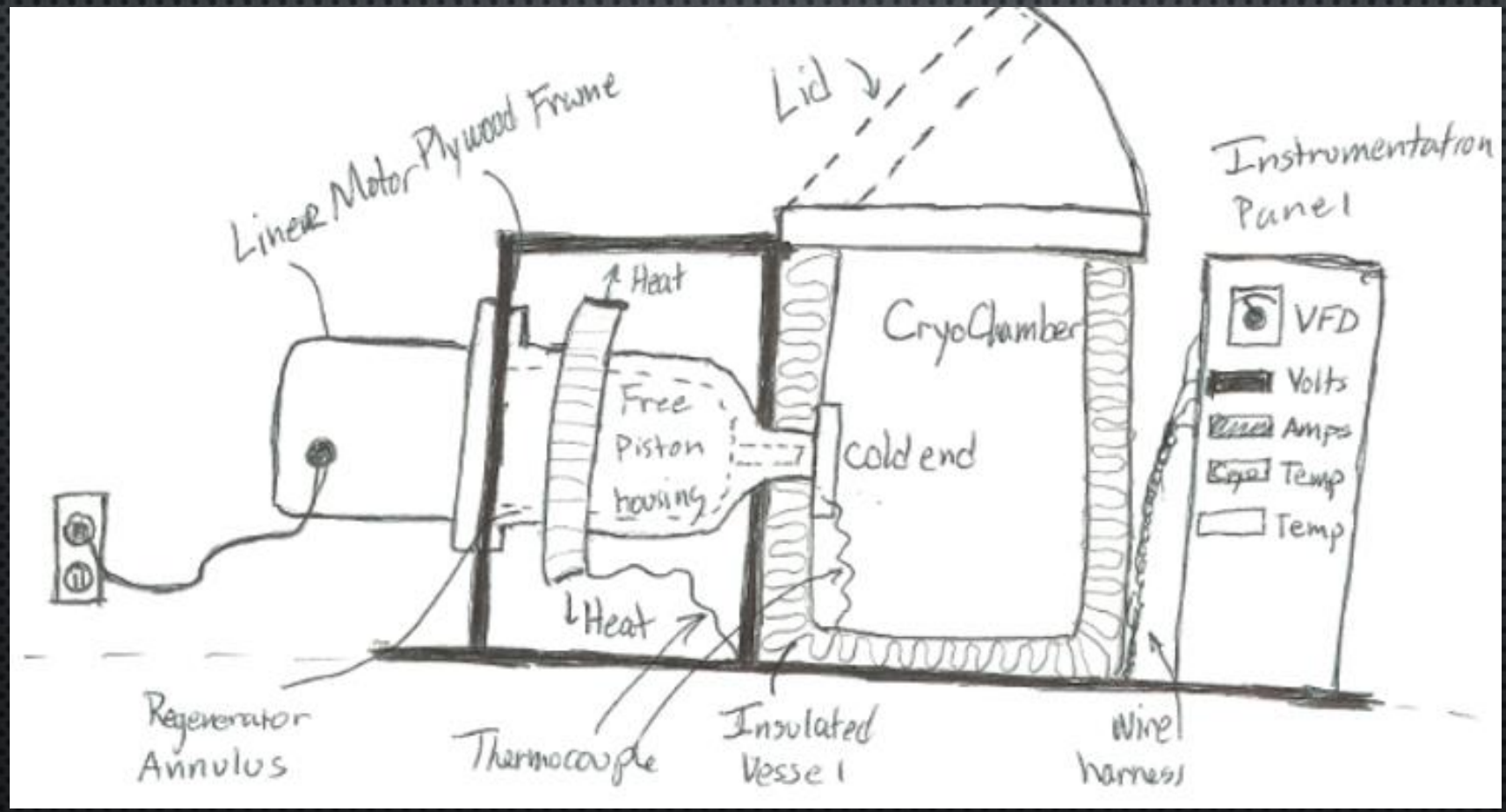
Ext. Dimensions (L“ x W“ x D")

27.3 x 13.7 x 18.1

[1] https://www.ebay.com/itm/Envirocooler-ActiVault-25L4C-Cooler

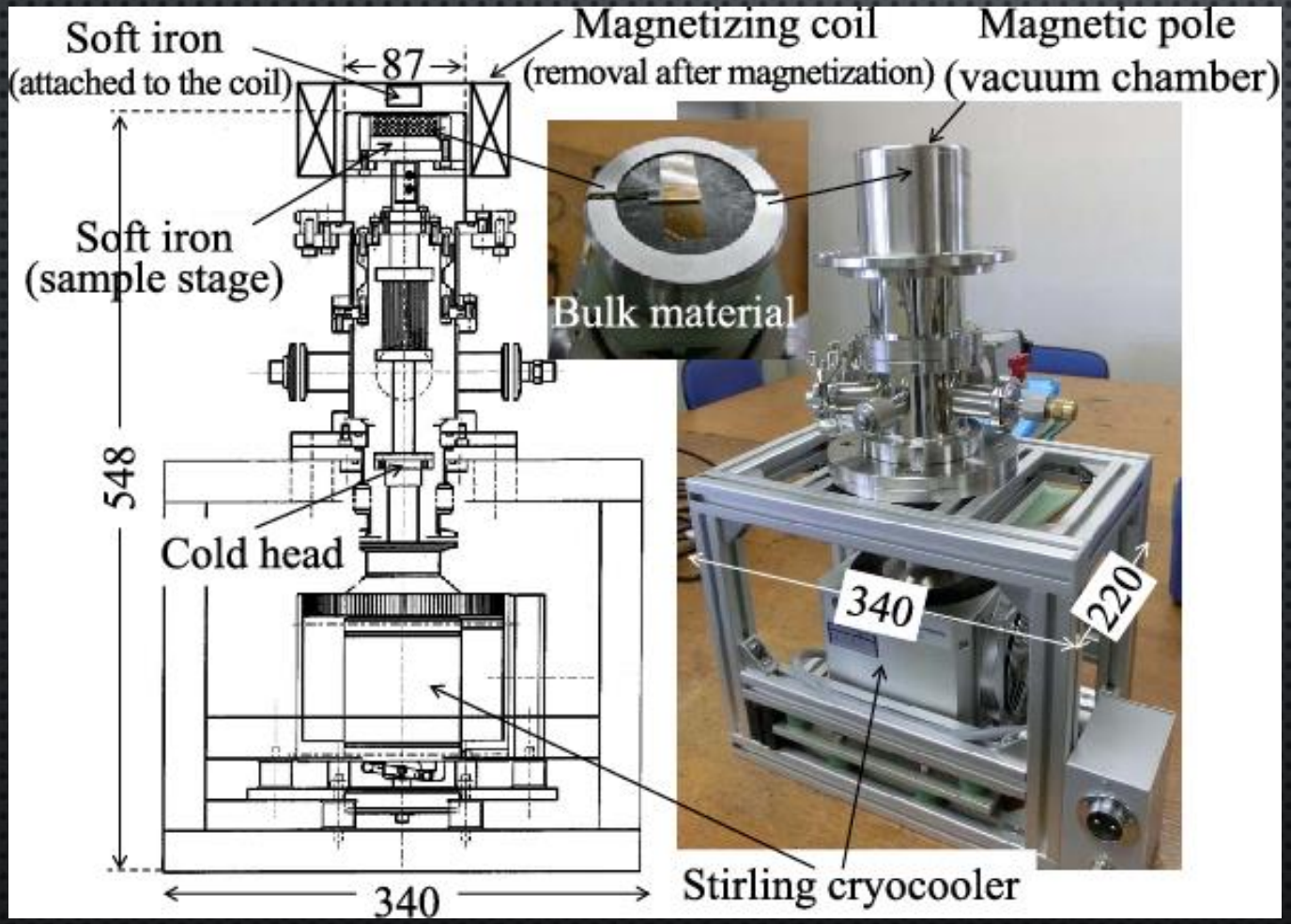
Presenter: John Wiley

Stirling Cooler #2 Sketch



Presenter: John Wiley
7/12/2018 Stirling Cooler #1

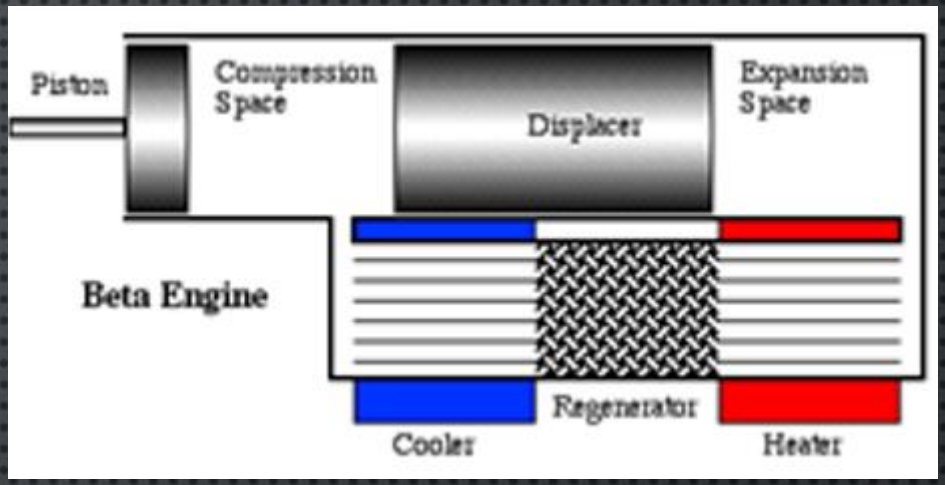
DESIGNS CONSIDERED 2

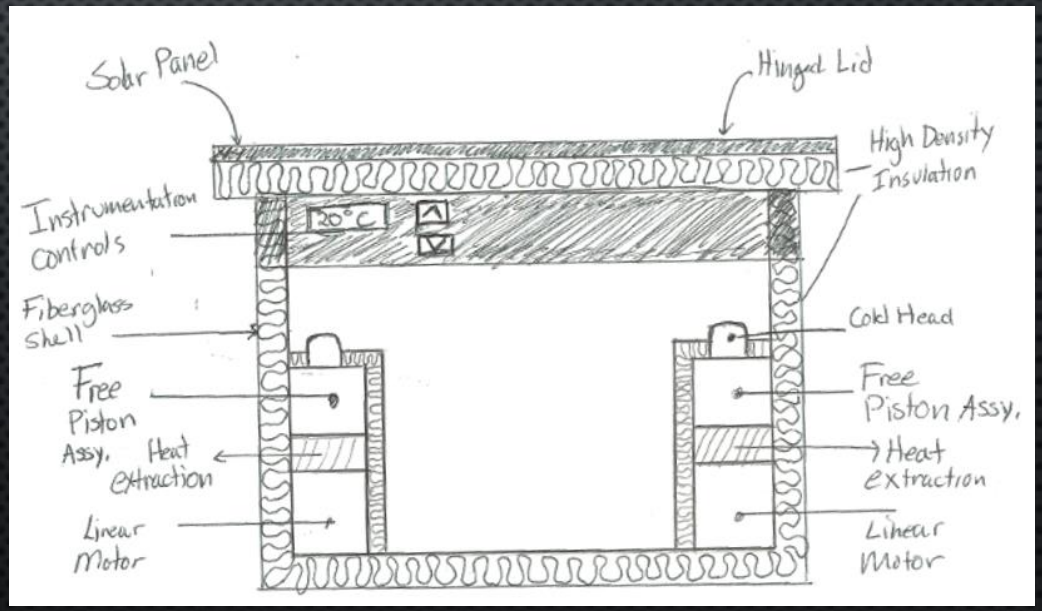


$1000+
Desktop Cryocooler
Creates Liquid nitrogen from atmospheric
Photo is general concept of cryocooler mounted above cooling vessel

[2] https://ai2-s2-public.s3.amazonaws.com/figures/2017-08-08/1cd7458aebe2f98ab918ed314c49e030a8e88e94/1-Figure1-1.png

Design Selected





Customer Requirements

Transfer Heat from cooler
Fits in Lab space
Externally Powered
Educational
Saftey
Cost
Durability
Manufacturability

Presenter: Luis Gardetto
7/12/2018 Stirling Cooler #1

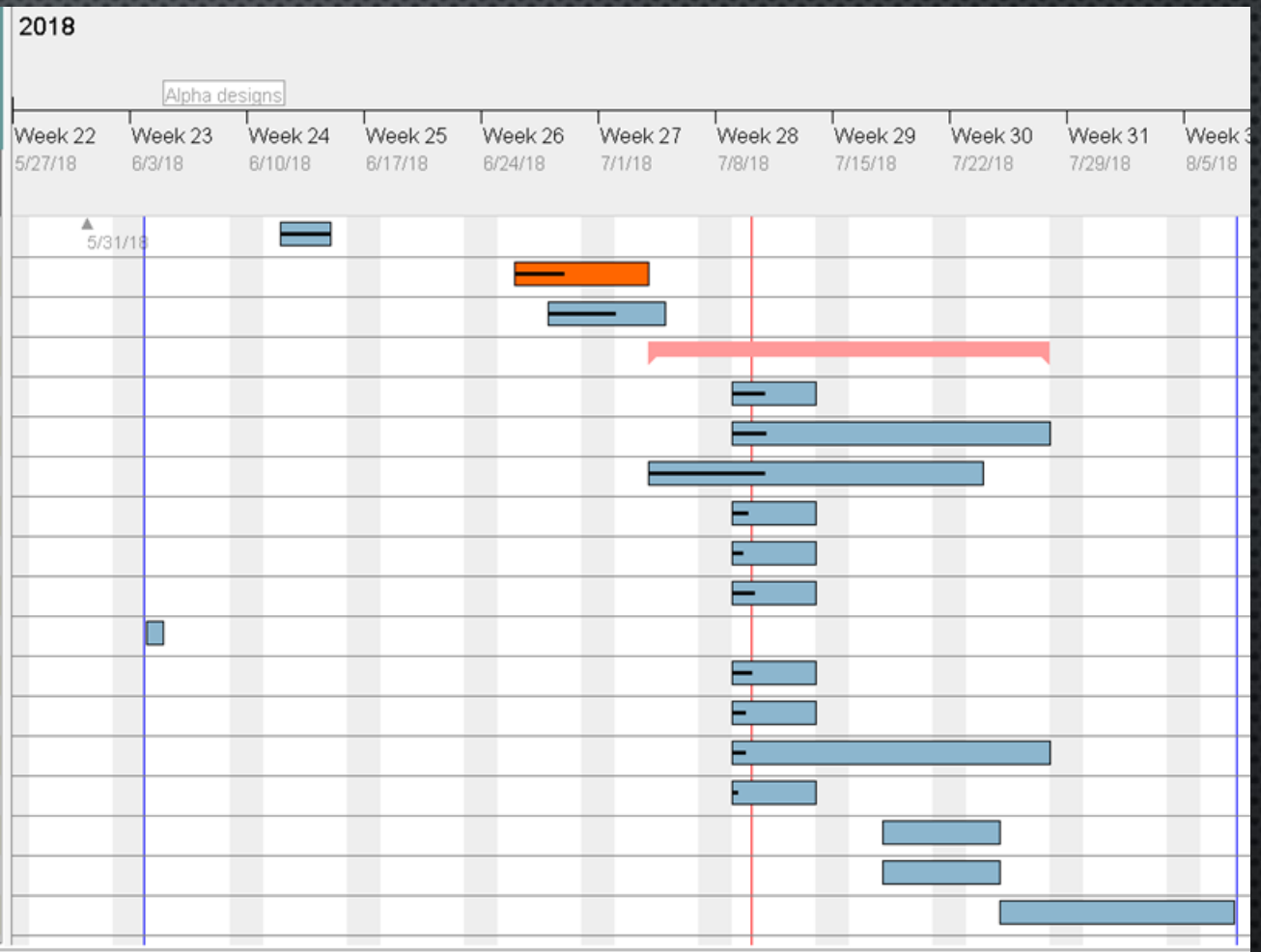
SCHEDULE

- TASKS ASSIGNED EVENLY AMONG TEAM MEMBERS ACCORDING TO TEAM RESPONSIBILITIES
- PROJECT IS ON SCHEDULE!
- REASONABLE TIME FRAME THAT COINCIDES WITH COURSE SCHEDULE.

Presenter: Abdulrahman Alazemi
7/12/2018 Stirling Cooler #1

Gantt Chart

Name	Begin date	End date
Meet Client	6/12/18	6/14/18
RegenerRegeneration mat...	6/26/18	7/3/18
Individual Analysis TEAM i...	6/28/18	7/4/18
Preliminary design	7/4/18	7/27/18
• Select drive motor	7/9/18	7/13/18
• Select regen material	7/9/18	7/27/18
• Indiv. Analysis final submi...	7/4/18	7/23/18
Material Selection	7/9/18	7/13/18
Website	7/9/18	7/13/18
Displacement Measurement	7/9/18	7/13/18
Price Listing	6/4/18	6/4/18
Piston and displacer dimen...	7/9/18	7/13/18
Heat exchangers	7/9/18	7/13/18
Cad Drawings for final desi...	7/9/18	7/27/18
Bill of materials	7/9/18	7/13/18
Design prototype	7/18/18	7/24/18
Purchacing Materials	7/18/18	7/24/18
Prototype construction	7/25/18	8/7/18



Presenter: Abdulrahman Alazemi
7/12/2018 Stirling Cooler #1

BUDGET

- Cost Range $250-$500
- Funding is available though department
- Stirling engine model for research $20
- Estimated cost could reach $500-$1000

References

[1] https://www.ebay.com/itm/Envirocooler-ActiVault-25L4C-Cooler-A-Jarden-Life-Science-Brand-12V-DC-ONLY/113038906351?hash=item1a51a4d3ef:g:Xg4AAOSwXoRa1W4n

[2] https://ai2-s2-public.s3.amazonaws.com/figures/2017-08-08/1cd7458aebe2f98ab918ed314c49e030a8e88e94/1-Figure1-1