Engineering Portfolio

Attila Haas – 2023.10.16

Projects from Imperial College

Battery Pack for hybrid Go-Kart

Third year design make and test project

Teammates: Aditya Vencatesan Basu, Edward Lee, Edward Wang

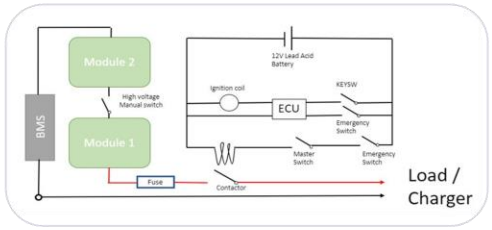
Result: A

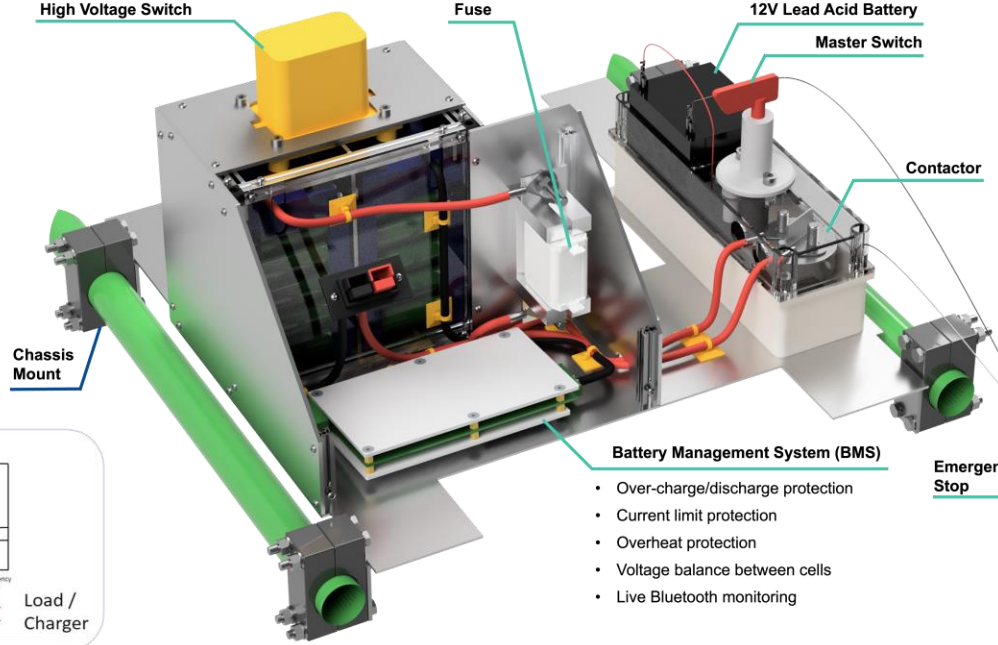
Technical Requirements

1. **Life:** Battery needs to last 30 minutes on the track.
2. **Safety:** Withstand debris and vibration; fully insulated
3. **Battery Voltages:** In range 50-120V for motor controller and 12V battery for engine control
4. **Temperature:** To operate within 10°C to 60°C
5. **Cost:** £1000 allocated

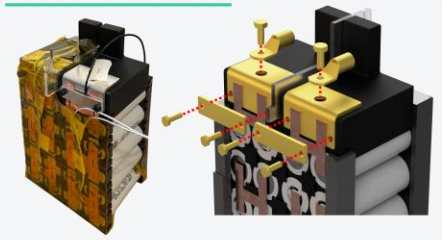
Molicel INR-21700-P42A

- Nominal voltage: 3.6V
- Capacity: 4200mAh
- Maximum current: 45A
- Maximum temperature: 60 C

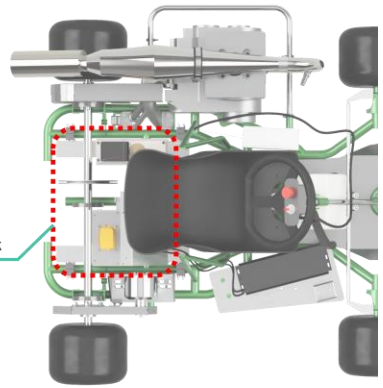




Module Assembly

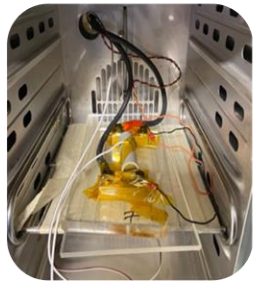


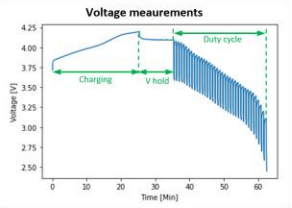
- 2 identical modules of 10S 2P connected using bolted aluminium clamps.
- TIG Welded H shaped Copper busbars were used for cell connections to minimise contact resistances.
- 3D Printed insulation coupled with acrylic sheets for constraining and additional safety.

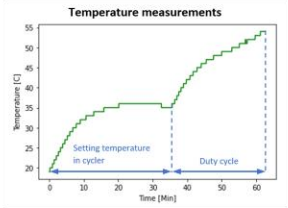


Single Cell test

Single-cell discharge tests were conducted to verify the cell's ability to meet the power delivery requirements and to gain insights into the cell's thermal behaviour during high current draw contingency situations.

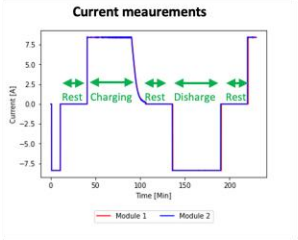


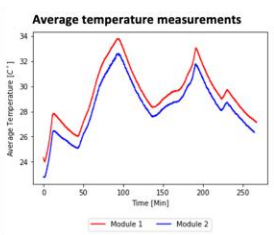




Module test

Module discharge tests were conducted on both modules separately to examine their manufacturing quality and thermal characteristics.





My Roles:

Project Management

Mechanical design

Engineering Analysis

Reporting

Result: A

Sailing Vessel Energy Harvester

Second year design project – Spring

Teammates: Alexander Christopherson, Jansen Papworth, Kayman Krishnamohan

Aim

Develop a sailing vessel energy harvester which powers onboard electrical systems including navigation, lights and a laptop while also charging a battery to allow continued use of electronics while stationary.

- 1 full week project

Target Market & Expected Use

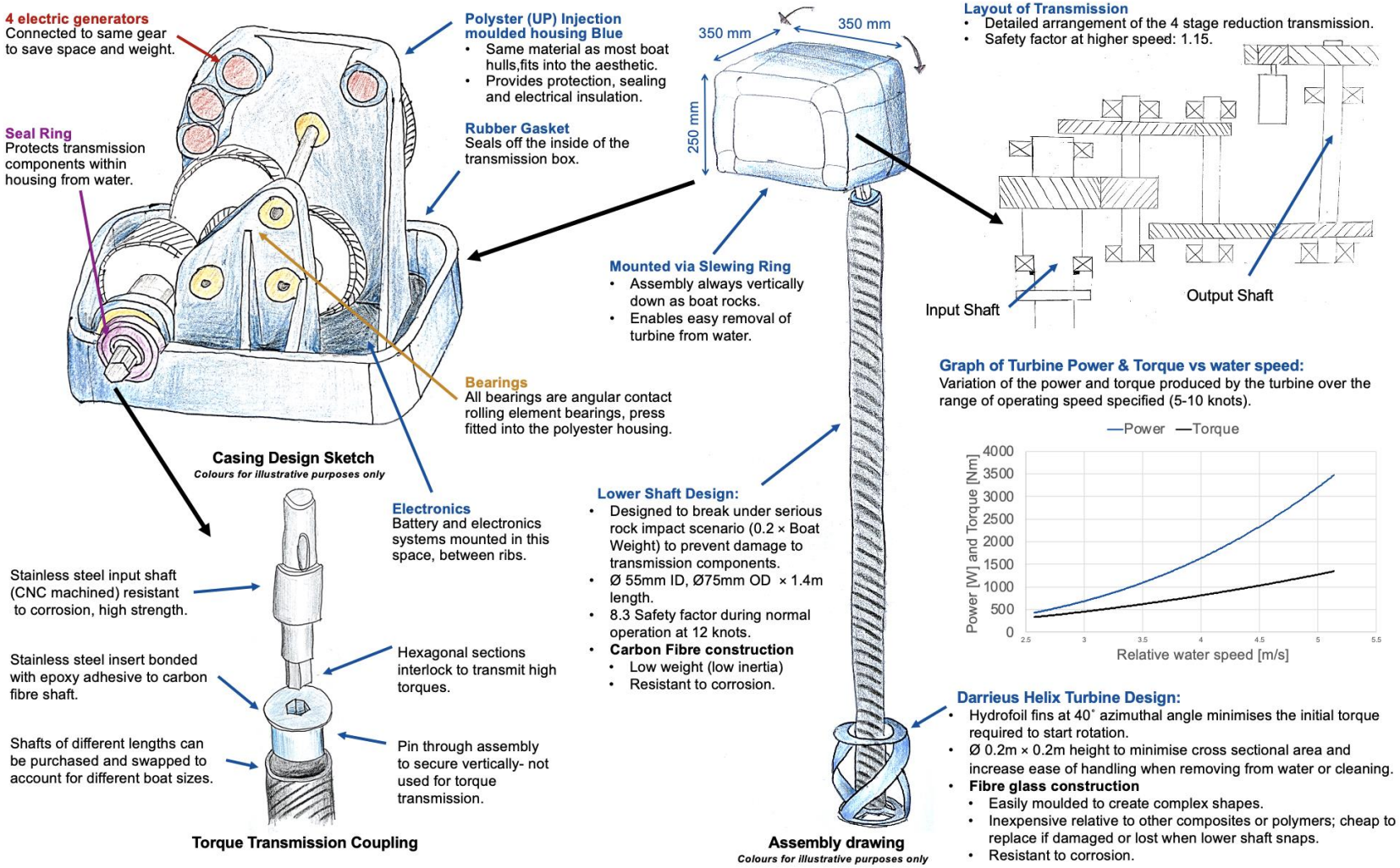
Initially designed for 30+ ft sailboats (14% of US sailboat market). Boats this size are often used for day trips with pauses at tourist locations or scenic spots.

- In use during comfort sailing, i.e. 5-10 knots (2.57- 5.14 m/s)
- Suitable for use in both fresh and saltwater conditions
- Used for 12 hours a day, 30 weeks of the year; 30ft+ sailboats often chartered for trips so in continuous use
- Must power navigational systems (110W, 12V), lighting (122W, 12V) and a laptop (60W, 19.5V)
- Can be mounted easily and safely by 2 people (18kg)
- Retail price approximately £3000

Technical Specifications

- 290 W generated at 5 knots, 440 W at 10 knots using 4 RS-655VA-28118 motors.
- Battery capacity of 81 Ah.
- Made up of 81 18650 cells, in a hexagonally close packed arrangement.
- 4 stage reduction gear box using helical gears
- Total reduction ratio of 1:525.
- Bearing L_{10} life 82000 hours, 33 years of expected use

Embodiment Design



My Roles:

Mechanical design

Engineering Analysis

Reporting

Result: A-

Gravity light

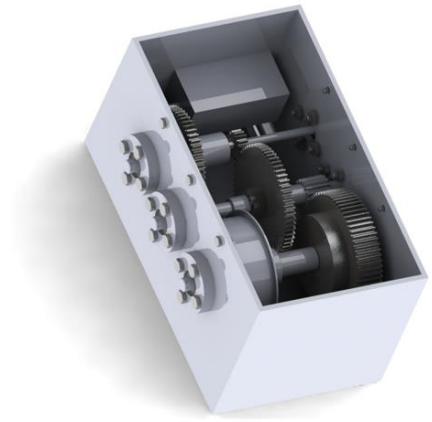
Second year design project – Autumn

Teammates: Ore Pelumi, Ashay Dhingra, Diego Sanchez Loarte, Suheyb Adam

Problem:

"Design, build, and test a so-called gravity-light: a reading light powered by a suspended mass that is slowly lowered, for use in locations where access to mains power and/or batteries is limited."

- Group 3-month project

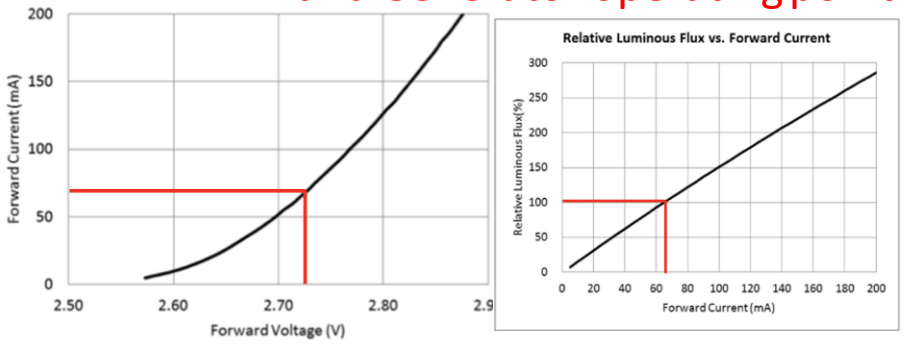


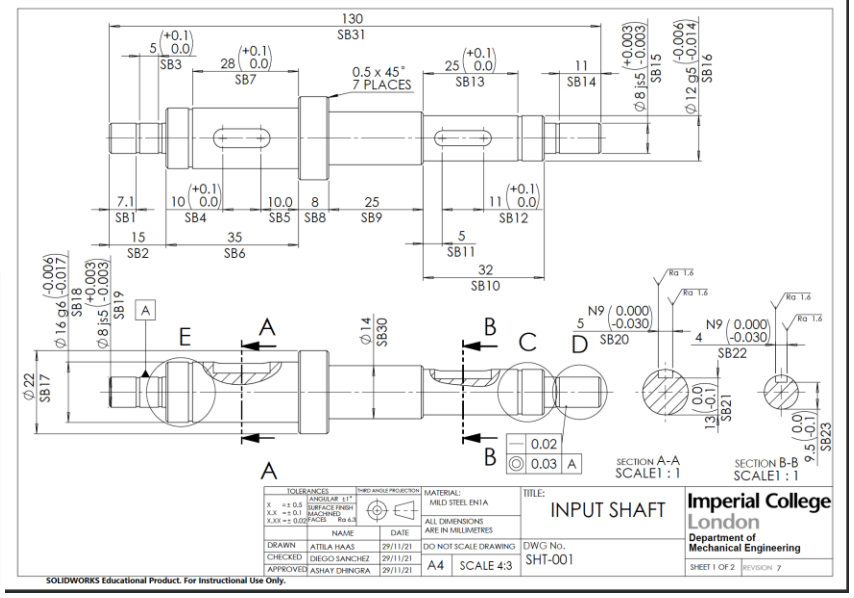
Solution:

Sheet metal box houses the generator, transmission and pulley to release potential energy at an optimal pace:

- Provides about 6 minutes of light
- Simplistic design allows for cheap manufacturing methods
- A prototype has been built in the workshop

LED and Generator operating point





My Roles:

Project Management

Mechanical design

Engineering Analysis

Reporting

Result: A (79.15%)

Brick Hoist

First year design project

Problem:

"Given a support structure and motor, design an actuation method and transmission to raise 50 bricks between single floors of a house!"

- Individual, 3-month project

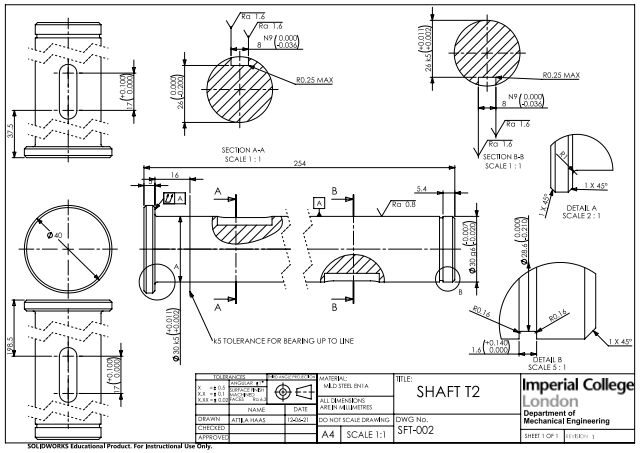
Solution:

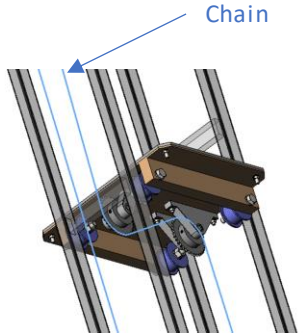
H-bridge inspired chain drive drives the platform

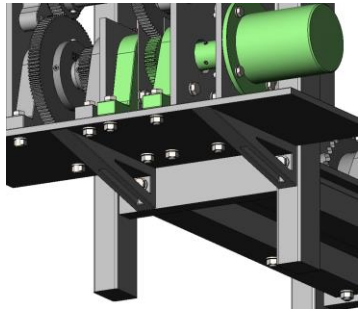
- Leaves the packing area open, and allows for fully lowering

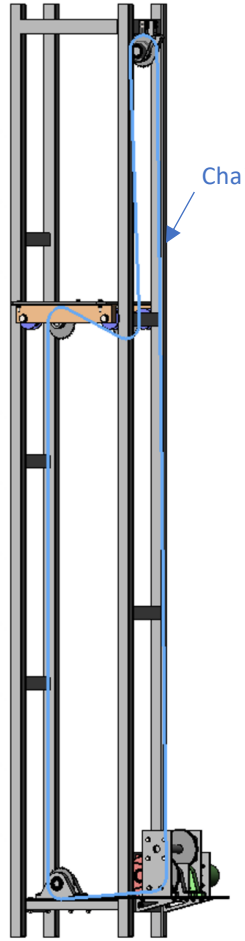
Triple reduction gearbox provides the coupling between motor and the chain

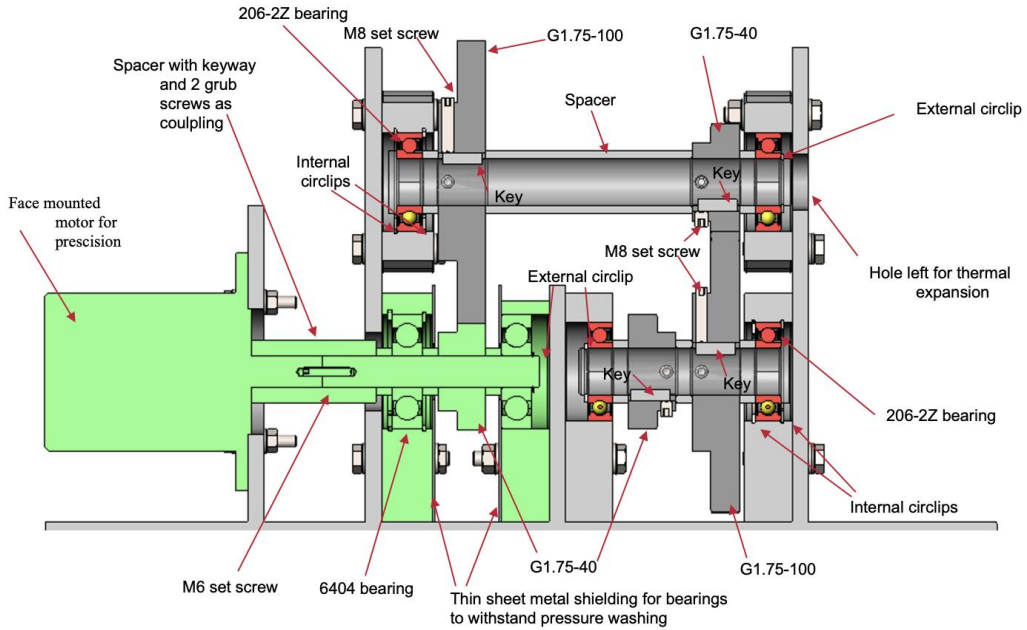
- Compact, cheap design, easy to maintain











My Roles:

Mechanical design

Engineering Analysis

Presenting