Tullio Marino

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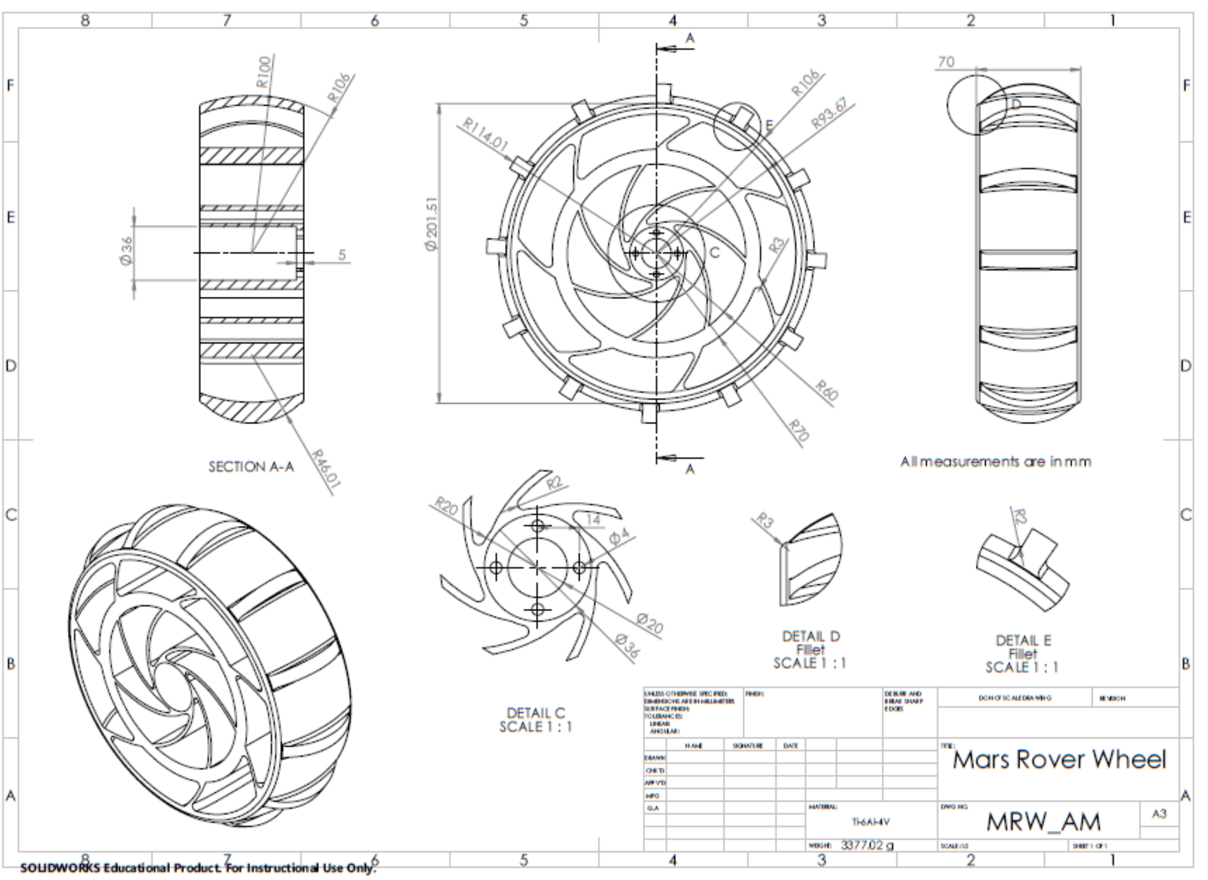
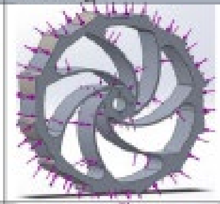
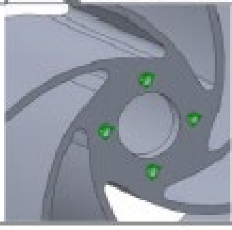
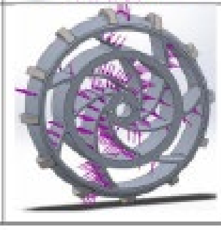
Email : placido.marino99@gmail.com

CAD and CAE display

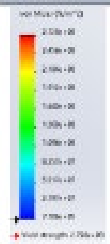
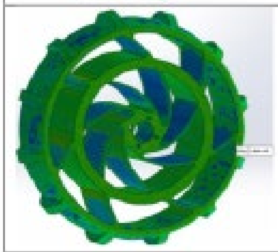
Design of Mars Rover Wheel for A.M.



Setup

Geometry	Fixtures	Loading	
			Force: 850 N Temperature: -67 °C
			Force: 850 N Temperature: -67 °C

Results

Stress Profile		Values	
			Max stress: 272.8 MPa Min FOS: 1
			Max stress: 266.4 MPa Min FOS: 1

Manufacturing Specification

Volume of the part: 761.42 cm^3

Build height: 73.00 mm

Distance from part to build plate: 3mm

Support needed: 5.49 cm^3

Build time: 129h 06m 13s

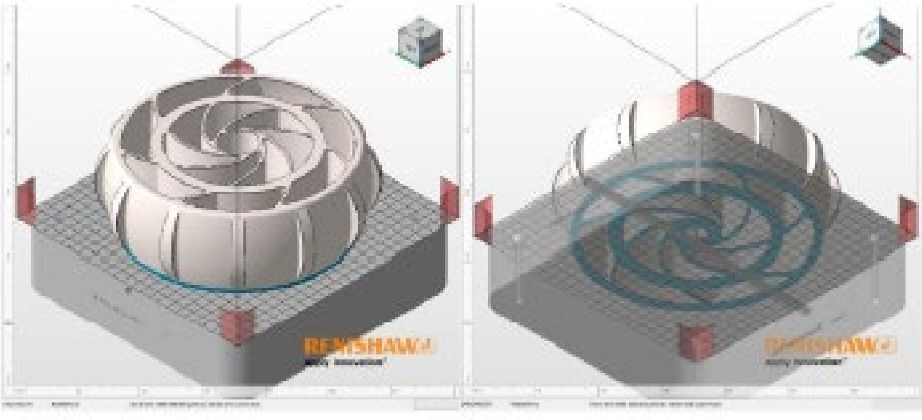
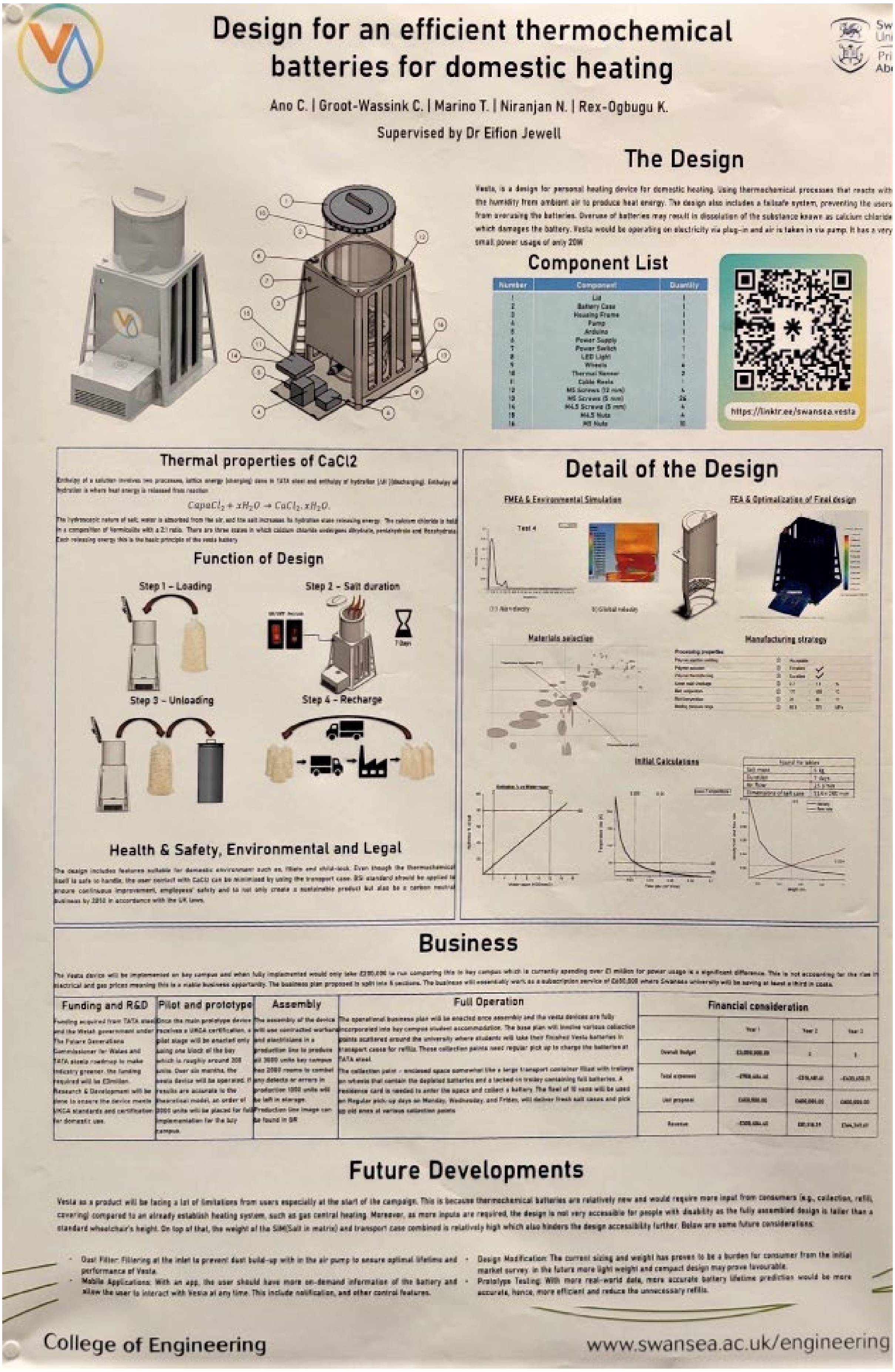
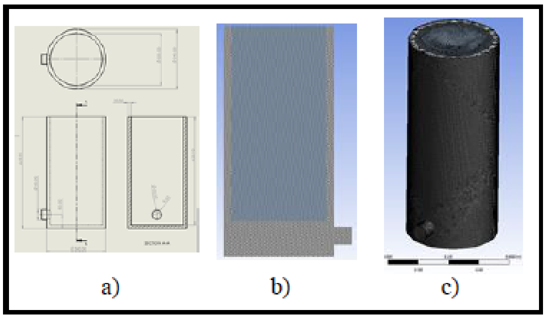
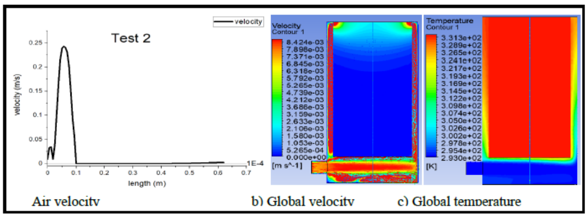


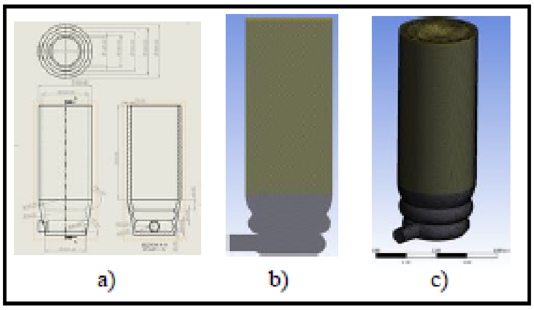
Figure 4 Final design printing orientation in Renishaw

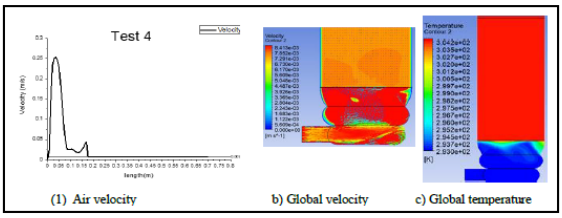
Design of a Thermochemical Battery for Domestic Heating

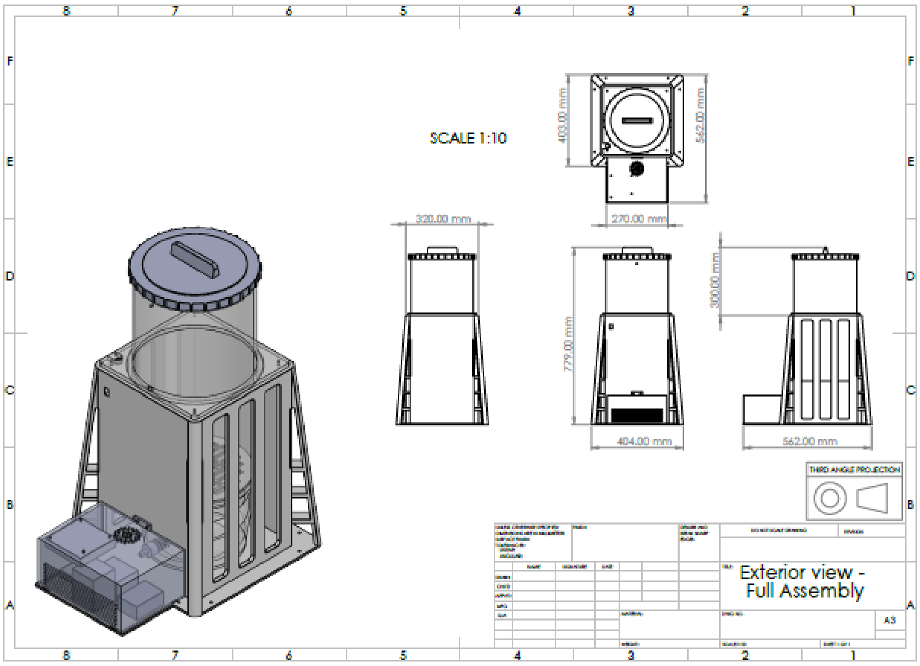


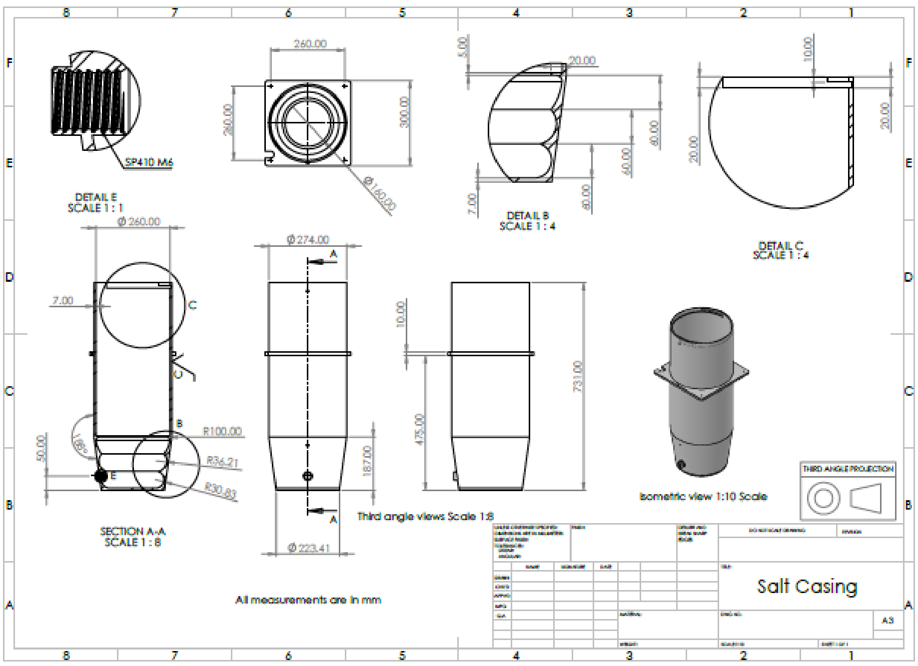

a)
b)
c)


Test 2
velocity
velocity (m/s)
length (m)
Velocity
Contour 1
Temperature
Contour 1
[m s^-1]
[K]
Air velocity
b) Global velocity
c) Global temperature

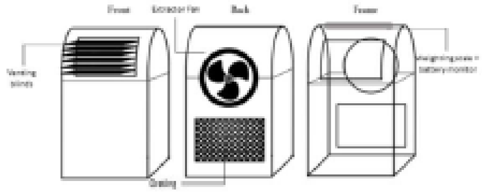
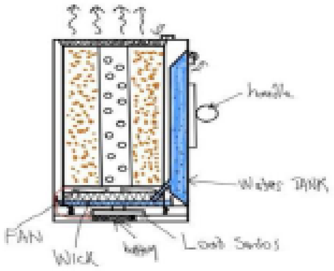
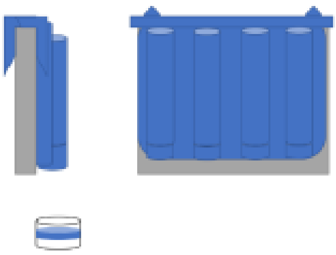
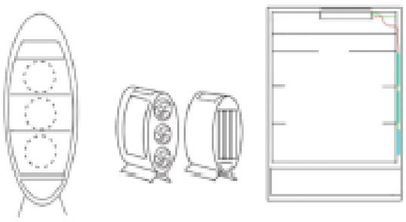

a)
b)
c)

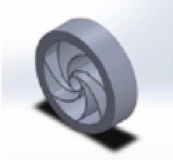
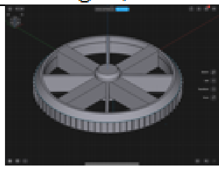

Test 4
Velocity
Temperature
Contour 2
[K]
(1) Air velocity
b) Global velocity
c) Global temperature


SCALE 1:10
403.00 mm
542.00 mm
270.00 mm
320.00 mm
779.00 mm
300.00 mm
404.00 mm
562.00 mm
THIRD ANGLE PROJECTION
Exterior view -
Full Assembly
A3

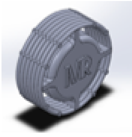
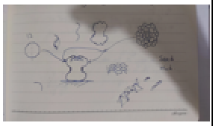
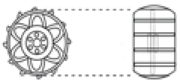

SP410 M6
DETAIL E
SCALE 1 : 1
260.00
300.00
Ø160.00
DETAIL B
SCALE 1 : 4
20.00
40.00
10.00
DETAIL C
SCALE 1 : 4
Ø 260.00
Ø 274.00
7.00
R100.00
R36.21
R30.83
50.00
187.00
475.00
731.00
Ø 223.41
SECTION A-A
SCALE 1 : 8
Third angle views Scale 1:8
Isometric view 1:10 Scale
THIRD ANGLE PROJECTION
All measurements are in mm
Salt Casing
A3

Sketches and concepts during pre-design

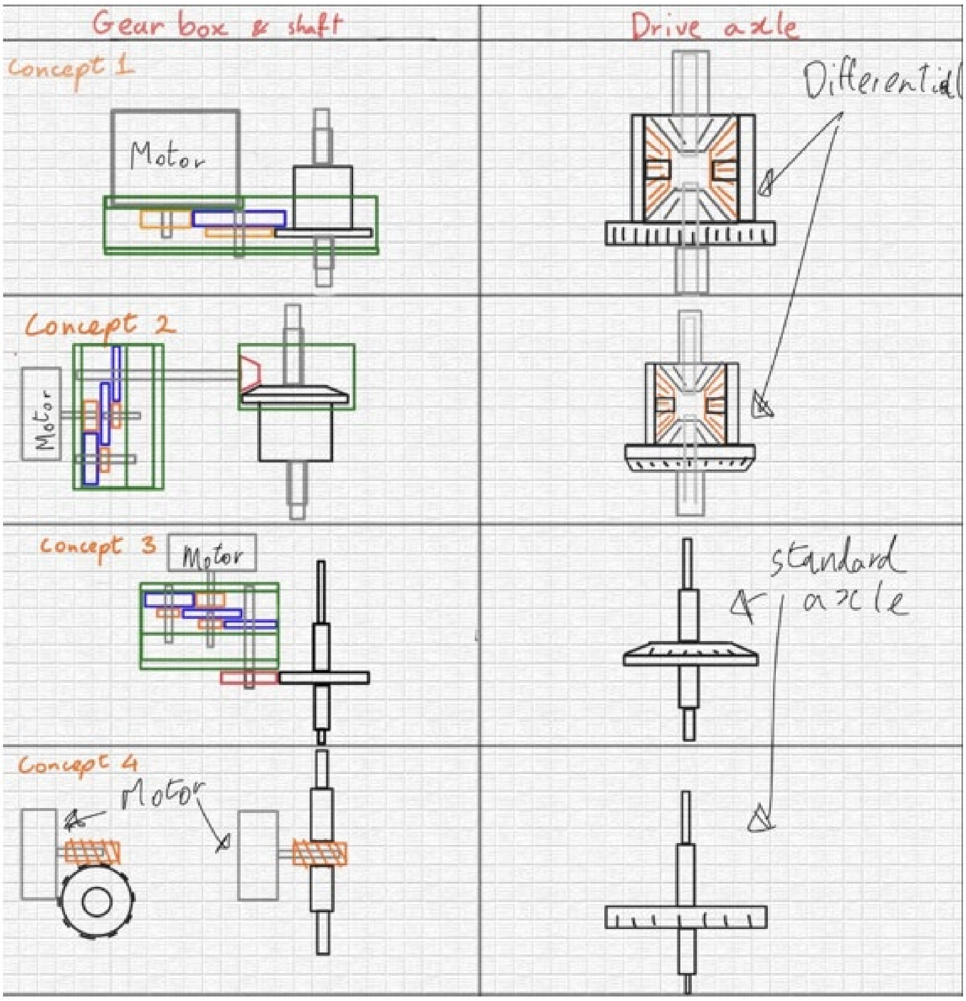
Concept Design	Features
 Design 1.	• Inspired by household dehumidifier with benefits of room heating. • Blind to allow air to circulate with in the room • Fan system to extract air through back grating when not in use
 Design 2.	• Detachable water tank flows to tray and wick delivers humid air through fan to the $CaCl_2$ for discharge. • Load sensor to see Δm to see weight difference correlating to battery life. • Detachable lid to remove salt for change of battery.
 Design 3.	• Each cylinder weight will be 5-15kg and 0.58m in length. • When salt conversion occurs, it can last up to 3 and 7 days. • With 4 to 5 of the cylinders with airtight seals the batteries can last up to a few weeks.
 Design 4.	• Allows moisture to be dispersed during airflow by passively soaking a cloth, which runs between the fans and the salt. • Amount of moisture is controlled by adjusting the gap size where the cloth absorbs the fluid. • Moisture or salt collected in the waste compartment is measured to monitor how much salt is being used.

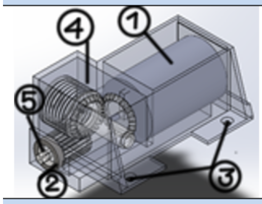
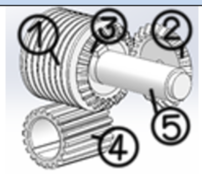
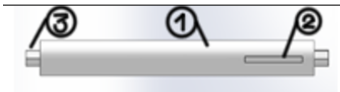
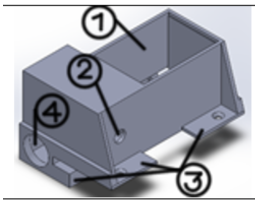
Design Selection		Con					
		Design 1, Chalisa		Design 2, Nish		Design 3, Lars	
							
Selection Criteria	Weighting	Rating	Weighted Score	Rating	Weighted Scor	Rating	Weighted Scor
Weight	20%	8.20	1.64	6.75	1.35	6.80	1.36
Machining complexity	15%	6.80	1.02	8.00	1.20	6.40	0.96
Manufacturing difficulty	15%	6.20	0.93	6.75	1.01	7.20	1.08
Printing orientation	10%	8.20	0.82	7.50	0.75	7.40	0.74
Rim support	10%	7.00	0.70	7.00	0.70	7.00	0.70
Tyre design	10%	6.80	0.68	6.00	0.60	5.00	0.50
Shaft connection	5%	5.80	0.29	7.00	0.35	5.40	0.27
Durability	5%	7.20	0.36	6.00	0.30	5.80	0.29
Aesthetics	5%	7.20	0.36	4.75	0.24	6.40	0.32
Costing	5%	8.20	0.41	7.75	0.39	6.80	0.34
	1	Total	7.21	Total	6.89	Total	6.56

cept

Design 4, Adebayo		Design 5, Samuel		Design 6, Tullio	
					
Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score
5.60	1.12	6.20	1.24	7.80	1.56
6.00	0.90	6.20	0.93	7.00	1.05
6.60	0.99	7.20	1.08	6.20	0.93
7.20	0.72	6.80	0.68	7.60	0.76
7.80	0.78	7.40	0.74	7.40	0.74
6.60	0.66	7.20	0.72	7.20	0.72
5.80	0.29	7.40	0.37	7.00	0.35
6.80	0.34	7.00	0.35	6.80	0.34
7.80	0.39	7.00	0.35	8.20	0.41
5.80	0.29	6.00	0.30	6.80	0.34
Total	6.48	Total	6.76	Total	7.20

Rating	(1-10)
1	unacceptable
5	acceptable
10	more than acceptable



Drivetrain Design		
	**1** Motor **2** Bearings **3** Screws **4** Gear box **5** Drive axle	The space available for the drivetrain was **restricted to 54x95 mm** to meet overall size requirement. To install a worm in the design **two bevel gears, 1:1 ratio**, have been used.
Component Design		
	**1** Worm gear **2** Bevel gear 1 **3** Bevel gear 2 **4** Driven gear **5** Worm gear shaft	It is best for the **driven gear to be a helical gear** as it betters the connection to the worm gear. The **worm gear can provide give a ratio of 20**, which is suitable for a motor of 3000rpm/v.
	**1** Drive axle **2** Driven gear pin **3** Wheel support	The drive axle has a **pin to keep a tight connection** between the rear gear and the shaft. The wheel shaft can be **hexagonal for a secure connection** to the wheel.
	**1** Motor holder **2** Worm Shaft support **3** Casing support **4** Drive axle support	The Drivetrain support must **hold the shaft** for the worm and bevel gears, as well as the drive axle for the rear gear. It also **provides a gear box** and must connect to the chassis.