

Hwa Chong Institution
Project Work
Category 3 Inventions Log Book

Title of Project: Project Ultra-Dry
Group Name: Project Ultra-Dry
Group Members: 1) DavianChan (4) 2O1 (leader) 2) Tan Zhao Ray (30) 2O1 3) Ryan Lim (22) 2I2 4) Jeremy Hew (15) 2P1

1. Problem Finding

(The beginning...)

Identify a problem you would like to solve. You may want brainstorm for problems using different approaches eg thematic, survey or general brainstorming etc.

1 A Document a list of problems you have identified. Your documentation should show clearly how your group came up with the problems.

To come up with the product, we firstly focused on problem that did not have a solution yet. These problems include:

- 1) Missing electronic parts
- 2) Sweaty palms
- 3) Sweaty/smelly clothes
- 4) Damp towels
- 5) Dirty clothing

1 B You should have selected a problem based on some considerations. Identify and justify these considerations.

Sweaty clothes and damp towels.

There were not many existing products that solved these problems. Additionally, these problems were similar in nature and can use similar solutions to solve.

1 C List some problems your group would like to solve. List also the considerations for selection of problem in the evaluation grid below. Score the considerations, against the problems, with points 1 (least significant) to 4 (most significant). Sum up the total points for each problem. Identify that problem you would like to solve.

Problem Evaluation Grid

*add more columns and rows where necessary

Considerations for Selection	Problems		
	damp & smelly towels	sweaty palms	dirty clothing
Existing products	4	2	3
Cost of existing product	4	2	3
Application and target audience of product	5	4	4
Total Score	13	8	10

2. Define the Problem

(This is one...)

Now that the problem has been identified. It is important to gather information on the extent of the problem and/or evaluate the usefulness of existing solutions based on *some criteria*. You may need to conduct surveys and research on existing solutions.

2 A Extent of the problem (Research and discuss the problem and write down the problem statement)

Many people have smelly and damp towels when they do not wash their towels often. However, washing towels take up a lot of water and electricity, especially when used often. Using the sun to dry the towels may not be reliable because there may not be sunlight available everyday.

Many people also have clothes that are only used once but are thrown into the wash as they are slightly sweaty, increasing laundry load This uses up a lot of electricity and water which in turn, waste money to pay for the electricity and water bill.

2 B Compare and contrast the existing or similar solutions.

Products:	Cost of the product	Electric/ water consumption	Installation	Size (cm)	Effectiveness (min)	Check
Washing Machine with Dryer function	\$600-\$1000	~15kw per month ~600 gallons per month	1 hour	85x60x60	7-12 towels at a time (60-90)	✓
Project Ultra-Dry	~\$30-\$50	7.2kw per month	20 min	50x50x40 (not finalised)	2 towels at a time (20-70)	✓ ✓ ✓
Wire heated Towel rail	\$70-\$200	~40kw per month	40 min	80x60x30	It can only hold 1 towel (30-90)	

3. Your BIG IDEA#

(Developing the idea...)

Write down your proposed invention and why you want to do it. State also how you think your proposed invention is better.

3 A Describe your proposed invention.

A multifunctional towel rack that uses UV lights and fans to dry towels/clothes and kill bacteria on towels.

3 B Explain the purpose of your proposed invention and the potential benefits to users.

- It can help people by drying their towels/clothes quickly and efficiently, leaving them with clean and dry towels/clothes
- It also helps to remove any bacteria in the towel, leading to a better smelling towel

3 C In what ways would your proposed invention be different and/or better than existing solutions, if any?

More energy/water efficient

More effective than some products, less time consuming

Relatively cheaper than other existing products such as the washing machine and the heated rail

3 D What are some problems you expect in the course of your proposed invention?

Too time consuming when building the prototype, some designs require channelling/redirection of wind which is very hard to do efficiently. It isn't aesthetically pleasing.

3 E What and when are the major milestone (project timeline) in your invention?

idea/shape of first prototype was created (T2W5)

First prototype was made (T2W7)

Testing of first prototype showed major flaws were identified (T2W8)

idea/shape of 2nd prototype was created (start of june holidays)

2nd prototype was made (june holidays 2nd week)

Experimenting of 2nd prototype and identification of some flaws (june holidays 3rd week)

#must be able to be constructed based on current / emerging technologies, must not violate the laws of Science or go against the laws of nature.

4. Construction or Modelling Process*

(This first... then that...)

You are now onto the fabrication of your prototype/ product. You need to select material and understand how to put them together so that your prototype/ product can perform its function.

First, we modelled our prototype in the 3D modelling app Thinkercad, then we made a rough sketch and plan on how to make the prototype. For the first prototype, we decided to make it in smaller scale to test the efficiency of our channeling tube. We also used excess wire and soldering tools/wire connectors to make a simple circuit to allow the battery powered fan to work.

2nd prototype:

- Improvement of idea, making and ideation was similar to the first prototype
- Added a more compact and efficient fan
- Uv lights were added

4 A Explain how and why the materials were chosen for the prototype/ product of your invention

We used Wood, Fan and UV lights that are battery-powered. We used wood as it is strong enough to hold the prototype and is relatively light

and portable. We used a fan so it can dry the towels faster. We also used UV lights so that it can disinfect the bacteria in the wet towels.

4 B Explore these considerations that may guide the construction of your prototype/ product.

We decided to use a battery pack as opposed to connecting it to a power socket because it would help to make the prototype more portable and safer because the power source might be exposed to wet clothes or wet towels.

4 C Document the prototype/ product development stages. You may use drawings, photographs or videos.

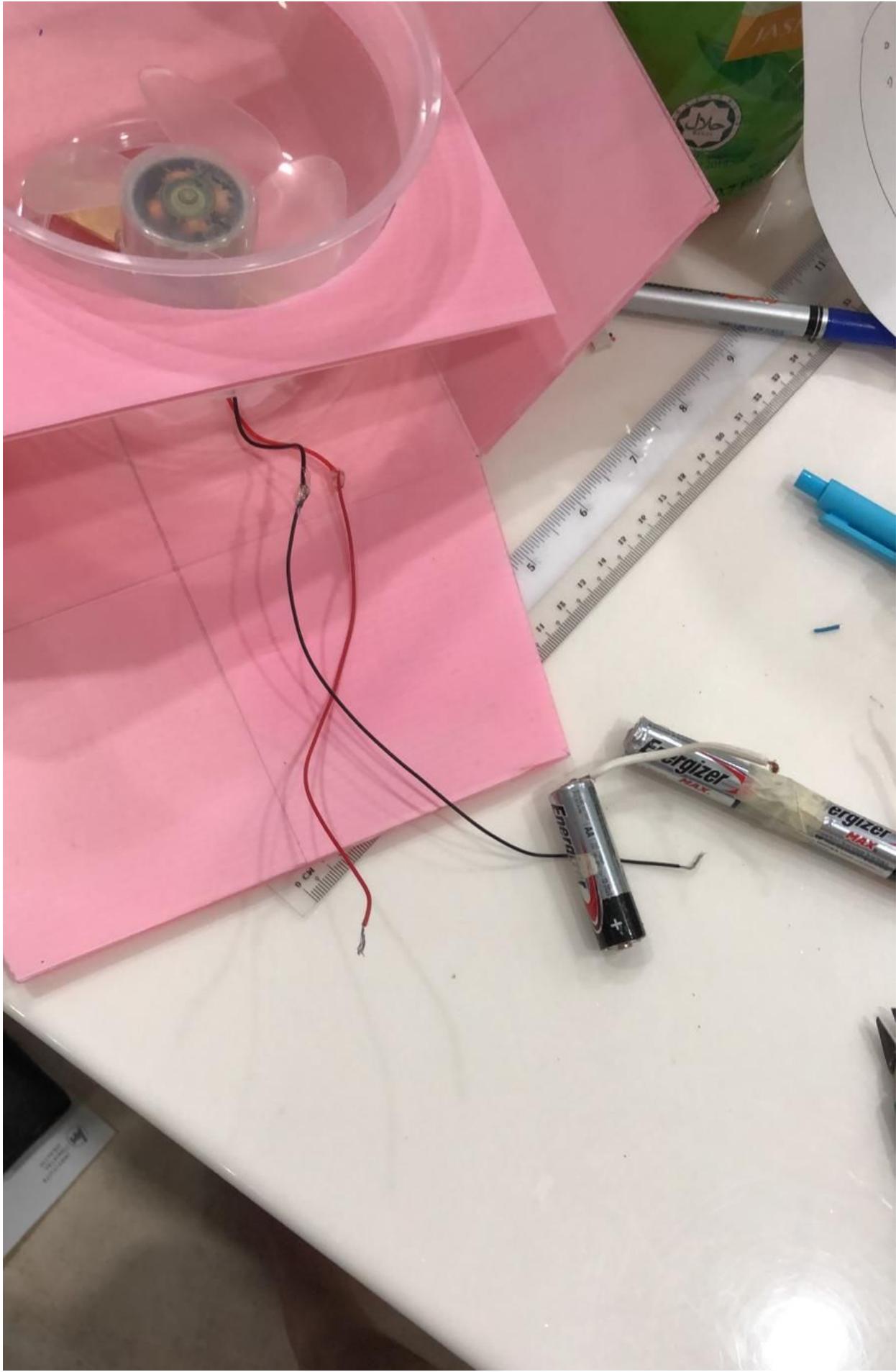
1st prototype:

Making of base using plastic board. Making of trapezoidal template, 20 X 20 X 17 (top of trapezium is 17 X 17)

Channeling tube made using plastic bottles and plastic container, attached with glue gun.

Used 2 AA batteries, 1 9-volt battery, wires, switch and salvaged portable fan to make the fan of first prototype.

Pictures:





2nd prototype:

Making of 3d model

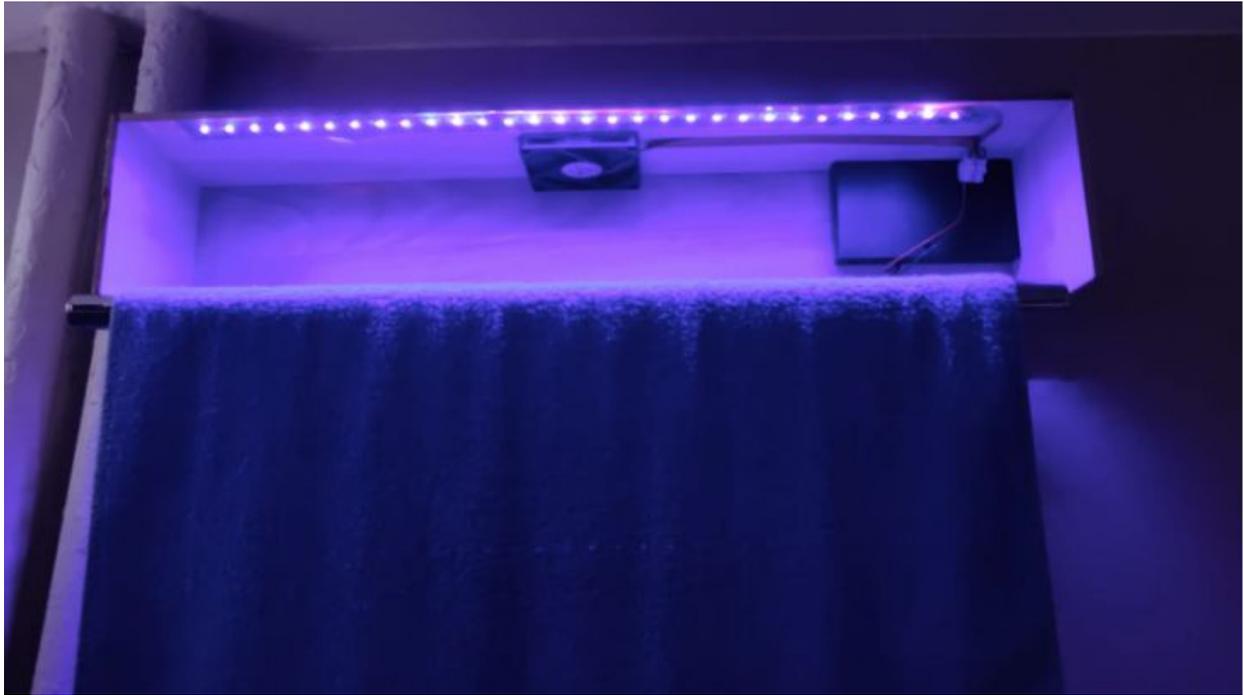
Solder wood to correct size in order to create a hollow box shape

Purchase of lights, cellophane paper, fan, central power source

Connect everything to the central power source using the connector

Use cellophane paper to make the UV lights





Pilot testing phase with UV lights and fans successfully connected to the central power source

End Product

Changes made:

- We bought a dual blade fan which can blow out twice the amount of wind as compared to our previous fan
- We closed up the model by adding a fourth wall which helps to channel the air downwards



Product in action!





OR

If construction of the prototype is not possible, then you have to create an animation / as a proof of concept that it can be applied in a bigger scale.

- 4A Explain why construction of a prototype is not possible and the proof of concept is needed in your case.
- 4B Briefly explain how the video / animation can effectively show how your invention will work and the different considerations.

Warning:

- *Video / animated simulation only if prototyping is absolutely no possible.*

- *Video / animated simulation must be logical and convincing that the invention works.*
- *Constraints must be clearly included in the logbook or the project will be heavily penalized.*

5. Modification and Evaluation

Upon the completion of your prototype/ product, you would need to see if it is working the way you want it to work. Check if your product has met the identified purpose and the user's need; and implement necessary modifications and improvements. This process may take several rounds.

5 A Write down your prototype/ product test criteria and check against it if it works. Identify areas of weakness for modification. Indicate the test iteration and date of test.

*Add more rows for more criteria

** Repeat table for next test iteration

Test Iteration:	Tick			Remarks
	Pass	Fail	Potential Failure	
Test Date: 20-22 may				
Energy consumption	✓			8 batteries Estimated battery life 6 months arranged in parallel 12 volt output from batteries
Fan speed			✓	Fan speed slightly low (1100) Fan speed is halved when channeled through the tube

Dry time		✓		Negligible effect on dry
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Test Iteration:	Tick			Remarks
Test Date: 7 june-9 june	Pass	Fail	Potential Failure	
Energy consumption	✓			8 batteries Estimated battery life 6 months arranged in parallel 12 volt output from batteries
Fan speed			✓	Increased rpm to 1250 Stronger than before
Dry time			✓	Stronger fan led to faster dry time Added UV lights to eliminate bacteria thus eliminating foul smell

Test Iteration:	Tick			Remarks
Test Date: 22-24 june	Pass	Fail	Potential Failure	
Energy consumption	✓			8 batteries Estimated battery life 6 months arranged in parallel 15 volt output from batteries

Fan speed			✓	Decreased rpm to 1200 Larger fan blades led to stronger wind overall
Dry time	✓			Stronger fan led to faster dry time Added UV lights to eliminate bacteria thus eliminating foul smell

Test Iteration:	Tick			Remarks
Test Date: 22-24 june	Pass	Fail	Potential Failure	
Energy consumption			✓	3 9v batteries Estimated battery life 1 week arranged in parallel 27 volt output from batteries
Fan speed	✓			Changed to a dual blade fan; able to have twice the amount of rpm as compared to the first fan
Dry time	✓			Stronger fan led to faster dry time Added UV lights to eliminate bacteria thus eliminating foul smell

OR if you are creating an animation / video to show how your invention will work, write down the different possibilities / outcomes [success or failure] if a full-scale prototype is to be constructed.

6. References

Read <http://www.bibme.org/citation-guide/apa/> on how to cite references.

6 A Cite the references you have used for your project work. Your source of reference should come from different types (eg books, magazine, websites, journal articles, interview, photographs, product brochure, reviews etc.)

(n.d.). Retrieved from

<https://www.bathroomtakeaway.com/uk/heating/towel-rails/electric-towel-rails>

Heated Towel Rail Timers & Installation. (n.d.). Retrieved from

<http://www.laserelectrical.co.nz/heated-towel-rail-timers>

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Electronic Components. (n.d.). Retrieved from
<https://www.mouser.sg/ProductDetail/CUI/CFM-5015V-172-381-20?qs=YCa/AAYMW03S7Vc5JdbwoA>

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https://www.mouser.sg/Thermal-Management/Fans-Blowers/Fans/DC-Fans/_/N-dwatb?P=1yd1512Z1z0sdx2

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