Low Noise, Light Weight and Compact Hair Dryer

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1. Introduction:

In the present scenario of designing better hair dryers for the consumers, problems from the consumer point of view must be found out first and the need to be addressed. Once the problems found out, we need to develop a primitive statement and then apply need analysis upon it to arrive at the goal statement. Then constraints and standards of performance along with specification are dealt with, based on the above drawn conclusions.

1.1 Primitive Statement:

Addressing the problems from the consumer point of view attracts a lot of interest from both consumer communities and industrial units. Designing of products based on the above inputs will make the best product. Thus, we look to proceed in this way in designing a better product.

1.2 Need Analysis:

Noise:

- Modern Hair Dryers make a lot of very disturbing noises.
- A less to no noise model has to be developed by redesigning the model.

Weight:

- Hair Dryers are always worked by holding them in one of the hands.
- The weight of the appliance is a problem owing to the longer usage times which is more pronounced in case of people with longer hair.

Size:

- Hair Dryers, as discussed above, are majorly of hand-held use.
- Hair Dryers that fit the best in single hand tend to get used the most.
- Thus, there is a need to address this problem and make the appliance compact.

1.3 Problem Statement:

"DESIGN A NOISE-LESS, LIGHT WEIGHT AND COMPACT HAIR DRYER"

1.4 List of Constraints:

- Operational Time: The time until which the hair dryer could be used without any break
- Budget: Low cost materials should be used to cut down expenses but shouldn't get compromised on the quality
- Adherence of the designed product to laws and regulations of the specific region(s)

1.5 Standards of Performance:

- 1200W Power output
- 550gm weight
- 1m power cord
- 3 settings of power

1.6 Specifications:

Technical specifications include:

- Colour
- Frequency
- Motor Wattage
- Motor Voltage
- Power Consumed
- Operational Time (in case of DC Motor use)

2. Generation of Design Ideas:

The product required to be designed is first broken down to the smallest possible component. Different levels such as 'System', 'Sub-System', 'Components' and 'Elements'. This is done to ensure that steps toward the goal statement include the smallest possible element in the product. All the possibilities of each and every element are considered and evaluation is done based on the grading policy that has been developed based on the design sense of the designer.

3. Evaluation of Design Idea:

Grading policy is followed while evaluating the Design Ideas. Each aspect of goal statement is awarded certain weightage based on design sense. In this design process, we awarded grades ranging from 1 to 9. If the aspect considered is needed to have a less value, then the possibility with least value is assigned with highest grade (9) and the possibility with the highest value is assigned the least grade (1). The same process is reversed for aspects that are needed to have more value. Below are the evaluation tables of the systems and sub-systems

Power System

	Cost (45%)	**Weight (35%)**	**Power (20%)**	**Overall**
Rechargeable	1	7.4	3.66	3.772
Non- Rechargeable	8.78	1	1	4.5
AC Power	9	9	9	9

Motor System

	Cost (40%)	Weight (30%)	Torque (30%)	Overall
Self - Excited	N/A	N/A	N/A	N/A
Separately Excited	9	9	1	6.6
Synchronous	N/A	N/A	N/A	N/A
Induction	1	1	9	3.4

Wiring System

	Cost (40%)	Weight (25%)	Resistivity (35%)	Overall
Copper Wiring	9	9	8.152	8.70
Silver Wiring	8.89	7.762	9	8.625
Gold Wiring	1	1	1	1

Exoskeleton

	Cost (40%)	Weight (25%)	Hardness (35%)	Overall
Polypropylene	1	9	9	5.8
PVC	9	1	1	4.2

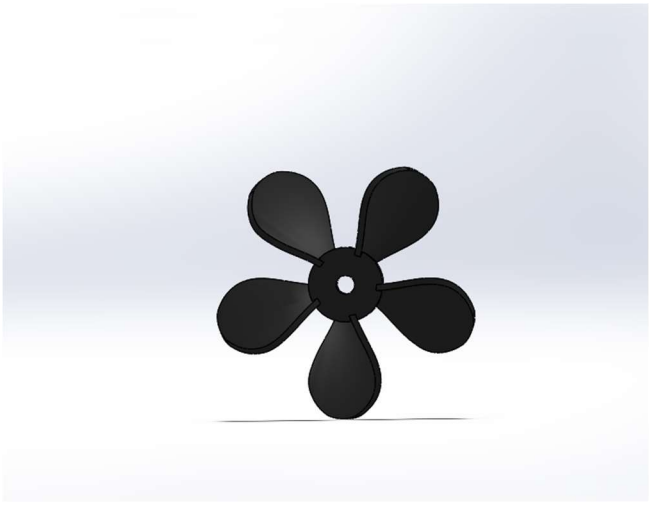
Working System of Heating Element

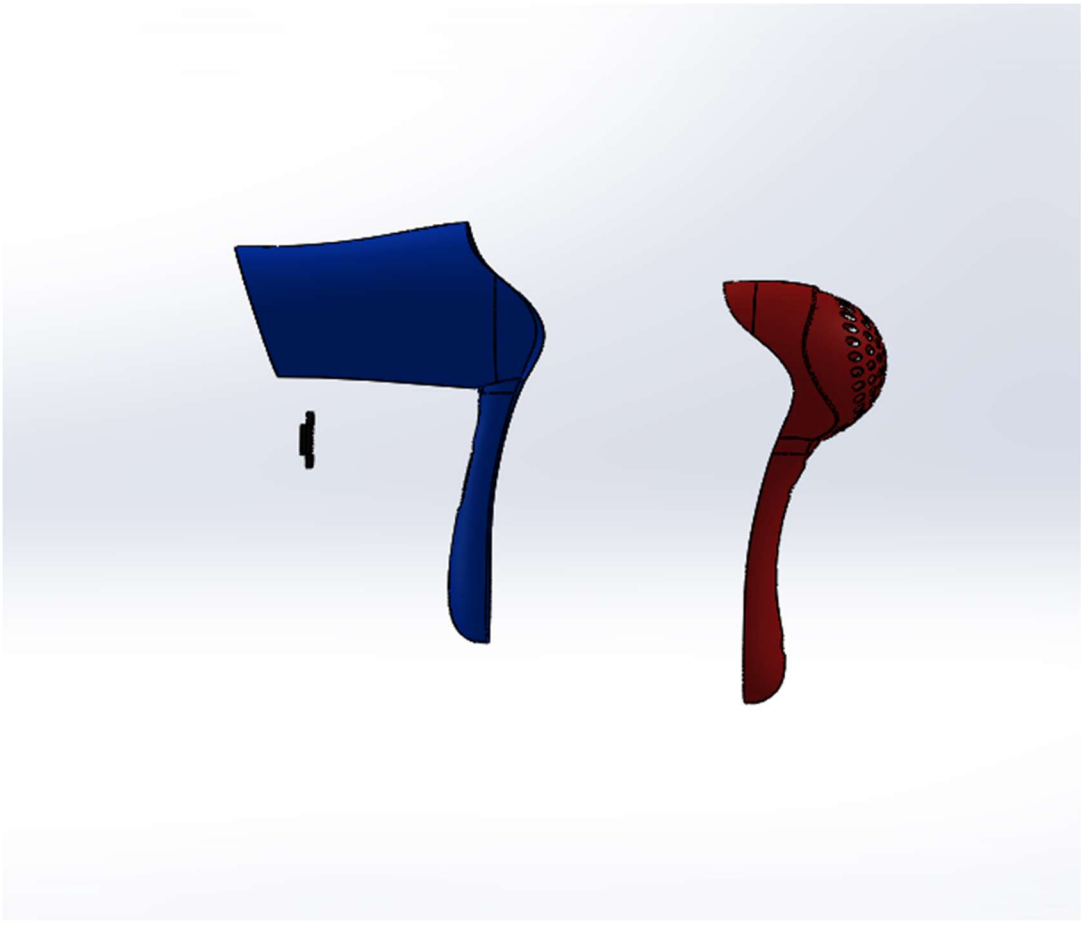
	Cost (60%)	Weight (20%)	Resistivity (20%)	Overall
Wire-wound	1	1	9	2.6
Fixed	6.73	3.24	9	6.48
Foil	9	9	N/A	N/A
Grid	N/A	N/A	N/A	N/A

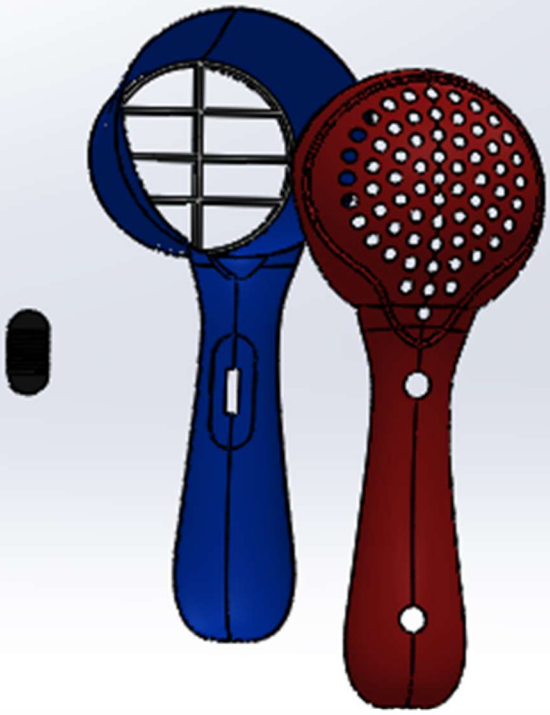
Fan System

	Cost (40%)	Weight (20%)	Specific Heat (35%)	Melting Point (10%)	Overall
ABS	1	9	3.13	1	3.23
HDPE	9	7.24	9	4.87	8.23
PET-E	7.79	1	1	9	4.51

4. Assembling of Parts:







5. Design for Development:

Based on the evaluations the following solution is arrived at:

- AC Power system must be used
- Separately Excited Single Phase motor must be used
- Copper Wiring Systems must be used
- Polypropylene must be used
- Fixed Resistor must be used
- PE- High Density must be used

6. Production:

Production of the design can be achieved at a very large scale by industries capable of producing parts from computer aided design systems followed by assembly unit. Modern and advanced customized techniques like 3D printing can be applied on this design producing more efficient products.

7. Marketing:

Analyzing the current market situation, hair dryers that particularly address the problem statement find greater demand. The target customers would be mainly domestic users. Promoting the product among niche users can help the company attain the breakeven in the first year itself. Collaborating with agencies producing hair care products may lead to better gains. Roping in professional marketers after the breakeven stage is reached may take the entire industry to a new level.

8. Cost Estimation:

The rough cost estimates can be seen as following:

Power System: **₹56**

Motor System: **₹130**

Wiring System: **₹16**

Exoskeleton System: **₹120**

Fan System: **₹40**

Heating Element: **₹72**

Miscellaneous: **₹35**

The production cost of the product is estimated to be **₹469.** The selling price can be priced at around **₹550** depending on the price ranges of the competitors and inflation ranges of the regions.

9. Final product:

The final product thus produced aligns with the goal statement discussed earlier with an estimated weight reduction of 10-15% and an estimated cost reduction of around 20% which may further increase if advanced techniques like 3D printing are employed.

10. Conclusion:

The entire design process has been gone through to align to the initial goal statement in the best possible way. The evaluations and grading policies made sure that the consumers' problems are perfectly addressed. The feature to set 3 settings of power may be termed as special feature of this hair dryer Better aerodynamic designs can be employed to lessen the noise produced by the hair dryers.