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# Product Design and Development of Mortar Pestle (Masala Maker) for Commercial and Domestic Use

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***Abstract:*** ***In this day to day life we are using masala, spices daily, many and more times for food, meals, chatni etc. Mixture of ingredients are important role in the flavour and taste of the foods. These mixture are also used in many foods, Meals etc. for stimulating and digestive properties. These properties is required the good mixing quality and Paste of masala ingredients. For these purpose the conventional method of crushing masala is testier and gives good quality of paste. For these we are designing the mortar pestle for domestic and commercial use. Steps for product design and development are Product Planning, Identifying customer needs, Product architecture and product Design. From these steps Product design and development of mortar pestle for Commercial and Domestic use.***

## I. INTRODUCTION

Masala crushing is the process where two or more food items are mixed together is carried out manually. Manually mixing of these food items requires human requirement and it also takes lot of strength and power. Either than mixer the conventional method is give the good taste and quality of masala. For making easy this crushing process human have to do continuous activity by hand and it's very hard.

By using mortar pestle we can crushing the masala ingredients better than mixer but manually it's hard. Also important for human health because of continuous movement of hands and body. So by product design and Development of semi-automated mortar pestle (Masala maker) is gives us good quality and taste of masala paste for the proper requirement in terms of quality, Quantity and cost. The product design and development of Mortar Pestle some steps are Product Planning, Identifying customer needs, Product architecture and product Design.

## II. PRODUCT PLANNING

The product plan identifies the portfolio of products to be developed by the organization and the timing of their introduction to the market. These planning are considered with market review and study as portfolio management, aggregate product planning, product line planning, or product management. Product plans are developed with the company's goals, capabilities, constraints, and competitive environment in mind. The roadmap of a product plan and the development of a product, start of actual product development process.

To create a product roadmap and project of product, we have a five-step process:

1. Identify opportunities.
2. Evaluate and prioritize projects.
3. Allocate resources and plan timing.
4. Complete pre-project planning.
5. Reflect on the results and the process.

## III. IDENTIFYING CUSTOMER NEEDS

The product design and Development needs customer identification which play very vital role for product specification and use. We take survey about our product and process development of mortar pestle from 10 to 12 customer. In this customer needs we ask some questions to customer and take their answers, feedback and advices about product what change they required.

1. We want to know the basic need while making masala paste. The basic need while masala making is pulverized, good mixing quality, good small paste and simple easy process.

2. We want to know the comparison between conventional equipment and mixer in which one gives us better mixture quality and taste. The all customer agree that conventional equipment's are best in mixture of paste and taste than mixer.
3. We want to know that quantity of masala is used by customer daily in domestic use is 250 to 300gm and Commercial use is 1 to 1.5 kg.
4. As compared to mixer cleaning it will be easy in mortar pestle cleaning. All customer agree that cleaning will be easier than mixer it also takes less efforts for cleaning.
5. We ask customer that what additional features you think required? All customer gives feedback that it's safe to use, Need of bowl Cover, less size and portable.
6. We also ask that if we develop this product can you buy it and what is your opinion? The all customer gives feedback that they will by because of its simple working, easy process, and Perfect size, portable, affordable. They also said that we use it daily because of easy cleaning and large output.

## IV. ESTABLISHING PRODUCT SPECIFICATIONS

The target specifications are established after the customer needs have been identified but all specification are generated with the consideration of Objective and practical manufacturing purpose of product.

### 4.1 Preparing list of Metrics.

**Table 1.** Table of List of Metrics

| M. No. | Metrics | Importance | Unit |
|---|---|---|---|
| *1* | *Damping Noise of product* | *4* | *DB* |
| *2* | *Timer and Automated Spoon* | *2* | *Sec* |
| *3* | *Bowl Cover* | *4* | *Dia.* |
| *4* | *Motor RPM* | *2* | *RPM* |
| *5* | *Capacity of Bowl* | *5* | *Kg* |
| *6* | *Oscillations of Ram* | *3* | *Times/min* |
| *7* | *Material of product* | *4* | - |
| *8* | *Size and portability* | *3* | *Mm* |
| *9* | *Bowl Coating* | *4* | - |
| *10* | *Physical strength and Reliability* | *4* | - |

### 4.2 Collect Competitive benchmarking information.

The overall team discussed with marketing team about how to create product with respect to market value. Product have always some competitive product so team have to study and get information in the market about product. The ram or plunger have lots of type's stone, wooden, metal etc. but we have to either Stainless Steel or Mild Steel for reliability and Strength. The timing of plunger oscillations will be normal not to fast or slow. The mortar RPM is also steady while working. The pulley gears we are using to convert rotary motion to sliding motion. The final product will easy to use, simple portable, less noisy, small weight and reliable than other products.

### 4.3 Set Ideal and marginally acceptable target value.

The mortar pestle have no. of specification but after market survey of competitors and as per customer needs. The product are marginally acceptable and widely used in the market, so as per customer requirement we set some specifications of product. The below table shows the Specification of mortar pestle with their importance as per market need, also every specification have their unit and unit value.

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**Table 2.** Table of final List of Specifications

| M. No. | Metrics | Importance | Unit | Std. Values |
|---|---|---|---|---|
| *1* | *Capacity of Bowl for domestic use* | *5* | *gm.* | *350 gm* |
| *2* | *Capacity of Bowl for Commercial Use* | *5* | *Kg* | *1 to 1.2 kg* |
| *3* | *Acrylic Lead Bowl Cover* | *4* | *Dia.* | *-* |
| *4* | *Material of Bowl* | *4* | *-* | *C.I.* |
| *5* | *Material of Plunger* | *4* | *-* | *M.S.* |
| *6* | *Oscillations of Ram* | *4* | *Times/min* | *120 Times/Min* |
| *8* | *Motor Capacity* | *3* | *Watt* | *90 Watt* |

### 4.4 Reflect on the Result and the Process.

In these overall process there are no missing of any specifications. The above final specifications or metrics are as per customer needs and requirements. The capacity of bowl for domestic use its 350gm and commercial use its 1 to 1.2kg for day to day use. For mortar pestle ram we use material mild steel has contain 0.25% of carbon and Rockwell hardness is 35Hrc. The Mortar bowl is curved shape bowl of cast iron material contain more than 2% carbon and 1 to 3% silicon, 1 % Manganese and Rockwell hardness is 35 HRc which is enough to handle the force of ram. Bowl is also electro plated or coated so the masala ingredients didn't stick to bowl and its helps to easy the cleaning process. Acrylic lead bowl cover material has density of 0.895 to 0.92 g/cm3. As per overall scenario of material and properties of mortar pestle product is perfect as per customer requirement and Capacity of product.

## V. ESTABLISHING PRODUCT ARCHITECTURE

Establishing the product architecture will have consideration of the product. In which the creation of rough schematic diagram which give us the clear basic structure of the product. Also with practical and manufacturing point it helps for product design. The design of product will start from architecture of product which help to generate the 2D and 3D model of product.
The following steps are:-

### 5.1 Create a Schematic of Product.

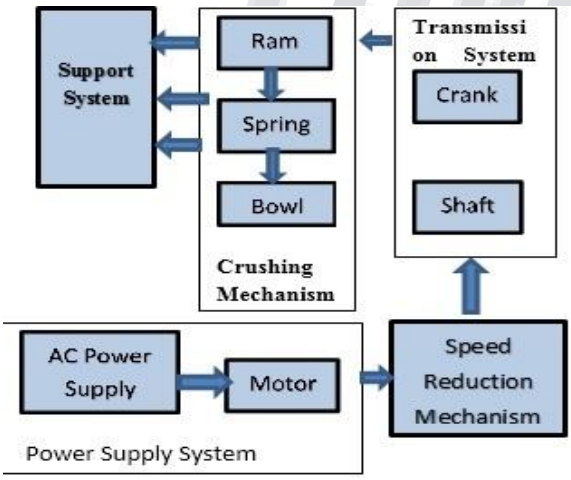


**Fig. 1**. Schematic Diagram of Mortar Pestle.

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### 5.2 Cluster all elements of Schematic.

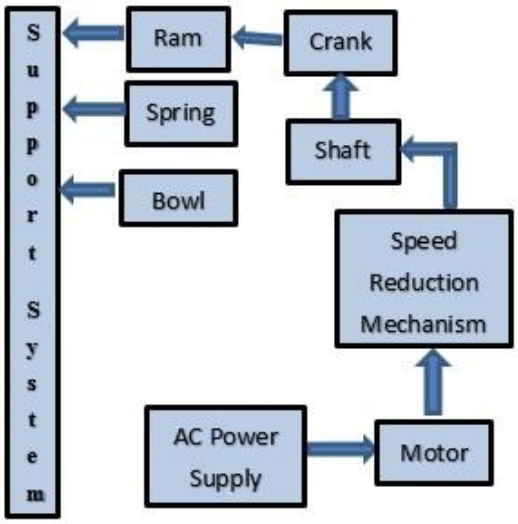



**Fig. 2.** Cluster the all Schematic of Mortar Pestle.

### 5.3 Create a Schematic Geometric Layout.

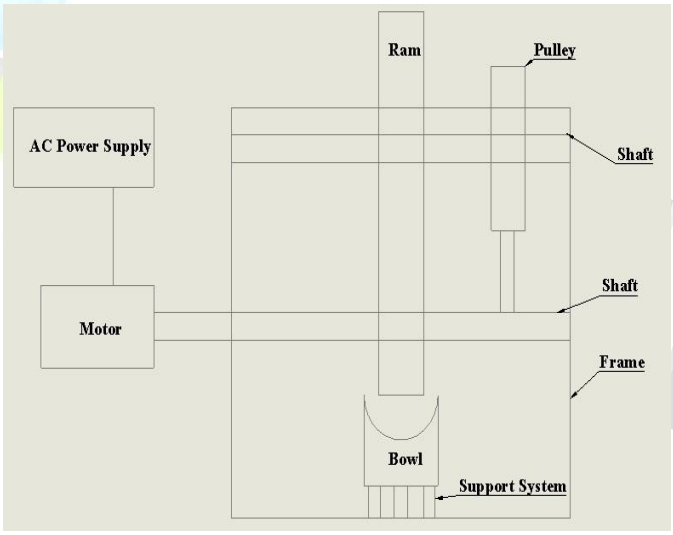



**Fig. 3.** Schematic Geometric Layout of Mortar Pestle.

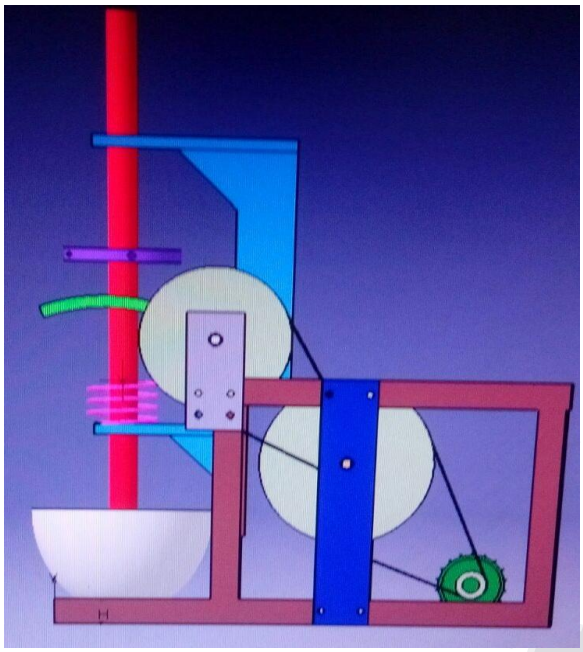
## VI. INDUSTRIAL DESIGN AND PROCESS

Engineers will generally follow a process to generate and evaluate concepts for the technical features of a product. Approach to design the product engineers have to create multiple concept to reach the customer needs.
Engineer generate the 2D and 3D drawing with less error, also with maximum possibility to manufacturing of the product.
Industrial Designer have to generate Product design with consideration of following points:
1. Consideration of customer needs.
2. Concept creation.
3. Preliminary refinement.

4. Final concept selection.
5. Model Drawing.
6. Coordination with engineering, manufacturing, and external vendors.

## VII. CAD MODELLING OF PRODUCT

With the help of overall data of product, parameters and concept design through overall process. We have to generate the design of the product using CAD tools.



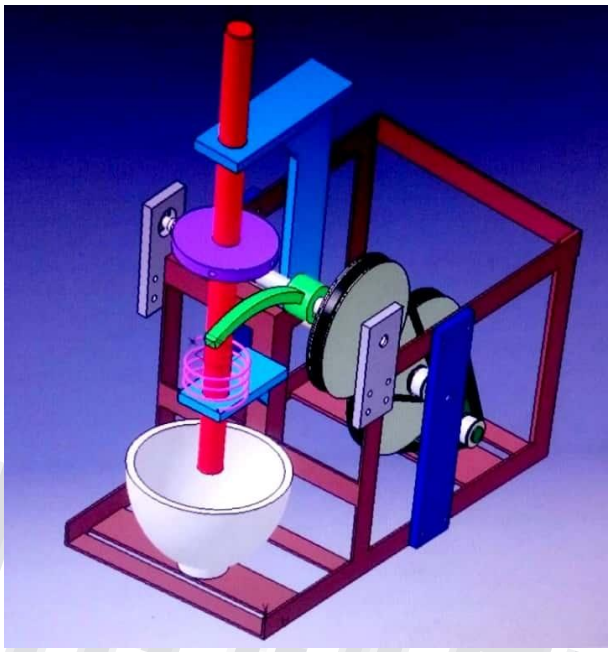


**Fig. 4. (a)** Side view (3D) of Mortar Pestle**.** **(b)** Isometric view (3D) of Mortar Pestle.

**Conclusion**

In this study, we have focuses on the Product design and development of an automated Mortar Pestle (Masala Maker) for commercial and domestic use. Mortar pestle gives result as below following:-

1. Simple Working and Easy Process
2. Better Paste and Masala quality
3. Less power required
4. Universal Mixing of Masala, Spices.
5. Capacity is fulfill the daily requirement.
6. Portable and Less Space required.

The above research is depend on basic principles of Product design and Development, so from above method we can design and develop any product or machine.

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