

HIMANG SHAKKARWAL



Himang Shakkarwal, design student of Delhi technological university, interested in field of product design, himang is more into finding innovative solutions to existing products and ecosystem, His primary research interests are Universal Design and Innovative Product Design And has performed well in various design projects.

Vegetable peeler

Abstract

The main goal of this project is to redesign a peeler and make it usable for all stages of peeling for food preparation. This project is a part of semester design project where the objective was to redesign and improvise the existing form of a vegetable peeler. Vegetable peelers are widely being used in almost every sector of cooking for the removal of the outer skin of the vegetable making it suitable for cooking. The whole design process is explained through this report which includes design methodology, procedure followed, final cad models of the product, background research and conclusion. The whole framework leads to the product design that eliminates the problems encountered and improves the functionality of the product.

INTRODUCTION

A peeler is a kitchen tool that mainly consists of a slotted metal blade which is attached to a handle. It is used for removing the outer layer which is called “skin” of certain vegetables often carrot roots, potatoes, cucumber and sometimes fruits such as apples, pears, etc.



Figure 1 and 2 Different types of peelers

Today there are numerous designs available of peelers. Most of these handheld peelers are either straight or Y-type; some design may vary depending on the personal preferences of the users. For the problem identification, a set of 60 users of peeler were chosen of age group ranging from 25-40 years. Ethnographic field study and contextual inquiry were done on

above-said users. The various issues were identified related to the functionality and usability of the product, i.e.,



Figure 3
Man using Y- type peeler



Figure 4
Man using a mechanical peeler

handle of the peeler being too thick or thin, peeler not being able to perform well on curved surfaces, handle being slippery, etc.



Figure 5
Man using potato peeler



Figure 6
Peeler in a rusted state

Objective

The primary aim of this project is to redesigning of a peeler and cater issues related to functionality and usability.

Importance of Ergonomics

In order to enhance the existing design or develop a new design solution designer needs to integrate ergonomics to maintain the balance between functionality and usability. The process of designing or arranging workplaces, products, and systems so that they fit the people who use them is called ergonomics. Ergonomics holds 8 fundamental principles these are: -

1. Maintain a neutral posture
2. Work in the comfort zone

3. Allow movement and stretching
4. Reduce excessive force
5. Minimize contact strength
6. Keep everything in easy reach
7. Work at proper heights
8. Minimize pressure points
9. Provide clearance

Wrist Posture in daily life activities

One performs fine manipulative work (speed and precision, e.g., holding a pen) with wrist flexion and radial deviation for day to day activities. Activities may involve slower and stronger movements and may require wrist extension and ulnar deviation like tightening the screw with a manual screwdriver under the dashboard of the car, etc. The maximum voluntary range of motion in different postures is exhibited in figure 7. The resting position of the wrist is considered in 12° wrist extension. An extreme flexion can cause muscle insufficiency, as the flexed wrist cannot grasp the tool firmly and an extended wrist affects finger movement. If one considers the grips used in daily life, it is of three types: power, hook, and oblique. In power grip, the position of the thumb is directly oblique and opposes the fingers, thumb, and fingers are wrapped around the object. The hook grip consists of a flat and curled finger, whereas thumb is not used in this position to grasp the object. In oblique, the thumb is extended to stabilize the grasping position. However, in pinch grasp, we require less strength as compared to a grip. The various types of grips are exhibited in figure 8.

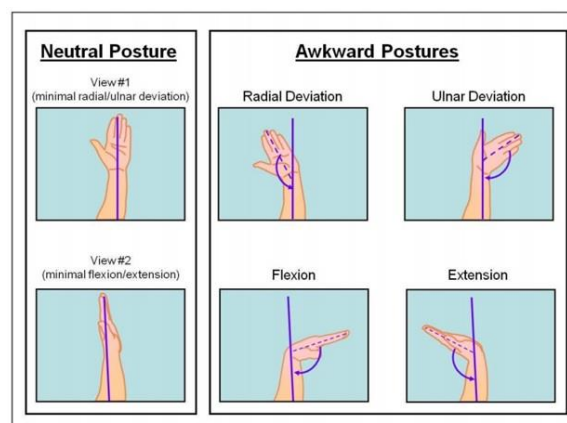


Figure 7 Neutral and awkward wrist postures

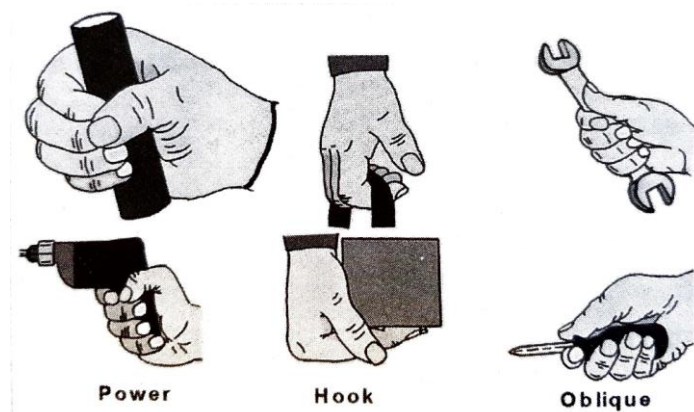


Figure 8 Various types of grips

The grip strength holds gender variation; the females have relatively lower grip strength as compared to males counterparts. A power grip is five times stronger than a pinch grasp. The grip strength of male and female is compared in table table1.

User study

Why is User Research needed?

1. To create designs that are genuinely relevant to users.
2. To create designs that are easy and user-friendly -
 “If the user is having a problem, it’s our problem.”
 —Steve Jobs, co-founder of Apple Computers
3. To understand the return on investment.

Table 1 Male and female grip strength

Grip Type	Grip Strength (lbs)	
	Males	Females
Two point pinch	17	11
Three point pinch	23	16
Lateral pinch	24	16
Oblique grip	65	38
Power grip	100	59
Hook	100	59
** Power grip \approx 5 times pinch grip		

Research Methods

Objective - Research Methods - Conduct & Organize – Analyze

There are many types of user research methods like persona building, card slotting, ethnographic field study, contextual inquiry, A/B testing, etc.

Here, in this case, ethnographic field study and the contextual inquiry was done on a group of 60 people of age group ranging from (25-40).

Ethnographic field study allowed to observe the user in their natural environment. During observations, it was precisely measured that what participants/users are doing and Understand why they are doing.



Figure 9 and 10 showing ethnographic field study

In contextual inquiry, the users were given a particular set of questions regarding the whole process of peeling vegetables, and their responses were recorded accordingly.



Analysis of user study

By both of the user research methods resulted in the same set of problems listed below.

1. The handle of the peeler is very bulky
2. The handle of the peeler is thin
3. Improper padding against certain joints
4. Blades not able to move properly on the curved surface
5. Handle becoming slippery
6. No raised area to act as a safety guide

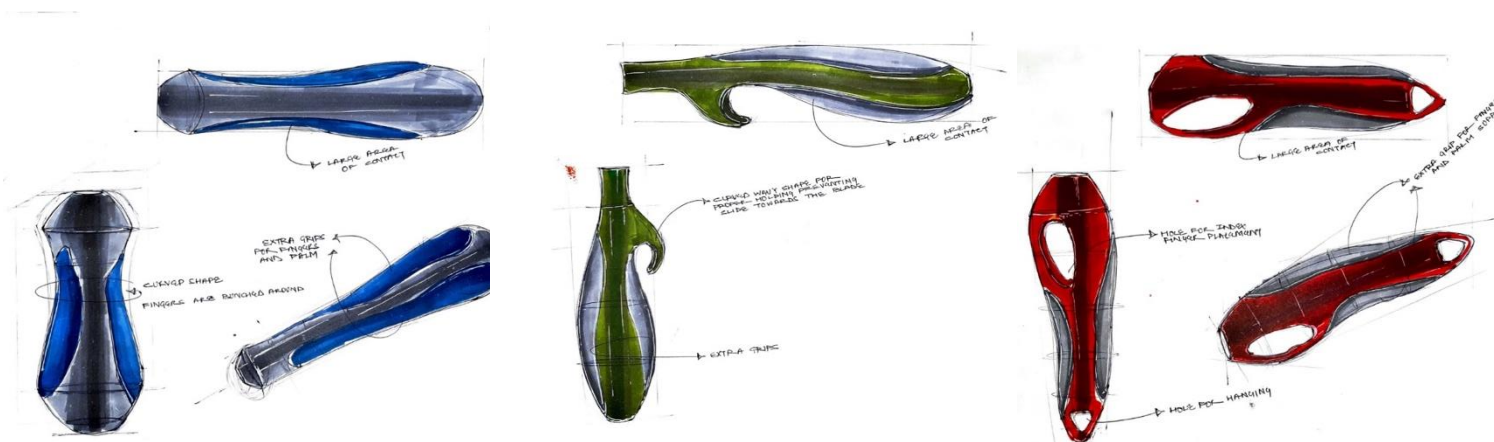
Concept generation

Need: -Handle should be designed in such a way that it should fit in the user's hand properly.

Concept generation: -Plasticine clay was used in generating impressions of palm. Here the clay was held in such a manner that it was imitating the same grasp when it comes to hold a peeler. this whole process resulted in giving a rough idea of how the shape and size of the handle should be.



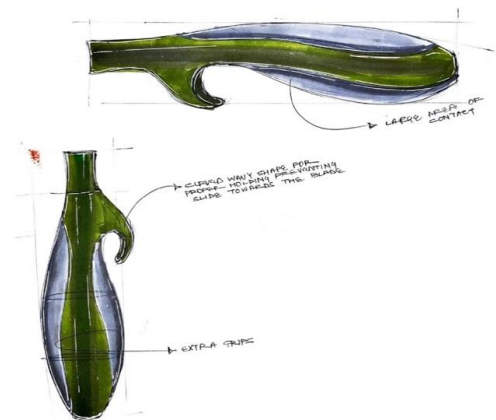
Figure 13,14 and 15 showing holding of plasticine clay



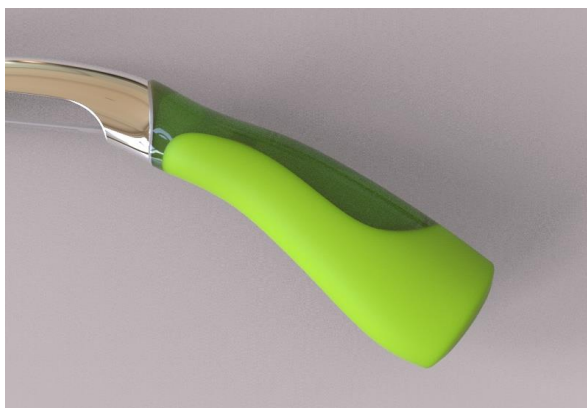
The final concept is an ergonomic solution to the problem.

Highlights of the concept

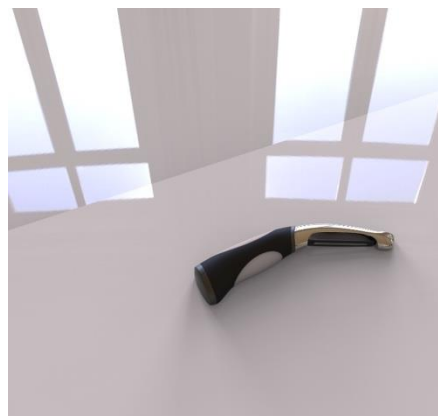
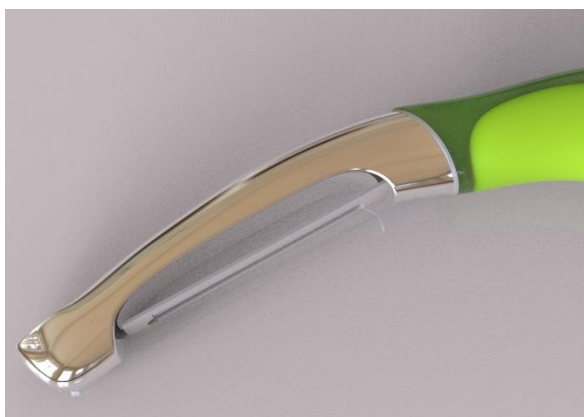
1. Bent spline which avoids awkward posture of hand



2. Ergonomic handle with minimum pressure points



Rotatable blades to work on curved surfaces



Conclusion

The final product designed is an ergonomically designed product that eliminates the functionality problems.

References

Work study and ergonomics by Cambridge

<https://ergo-plus.com/fundamental-ergonomic-principles/>

Anthropometry data by Dev Kumar Chakraborty

<https://www.ergonomics.com.au/what-is-ergonomics/>