The Effect of Ergonomics to Improve the Convenience of the Consumer Packaging of Edible Oil Industry

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Abstract. Various packaging system are used by edible oil industry. It is observed that consumer's preference are least considered in such packaging. There are several convenient system are available to improve the ergonomic aspect for packaging of edible oil. This ergonomic aspect like handle, cap opening/closing, holding pattern during pouring and carrying etc. With proper consumer inputs and ergonomic principles, design research designers have developed edible oil jars in an attempt to make more Convenience to the consumers which can provide better maneuverability during use. This paper aims to display package design where principles of ergonomics were considered.

Keywords: Package design · Design research · Ergonomics · Design process · Usability

1 Introduction

Ergonomics is about combining the science of the human body with design to create products that look great, perform flawlessly, and fit perfectly in the physical world. It's about fitment of the users' physical, cognitive, and emotional needs. It may be defined as the application of scientific information concerning human beings to the problem of design. Ergonomics require some kind of evidence that a satisfactory match between product and user has been achieved. The most important function of ergonomics in packaging design is physical and psychological relationship between objects and the people who use them. Users have to interact with the equipment in comfortable and efficient manner. Ergonomics is to make the usage of the given product easier, more comfortable and clearer to understand.

According to Don Norman's design principle the basic of packaging design lies in seven principles. The first important principle is visibility, which refers to the more visible functions, which help them to know what to do next. The second important principle is mapping which refers to the relationship between controls and their effects in the world. The third important principle is affordance, which refers to an attribute of an object that allows people to know how to use it.

Ergonomics plays an important role in the design of a packaging of a product in the packaging industry. Industrial designers pay close attention to the how consumers interact with the product and package design. This study helps the designers to resolve the unmet needs of the customers and avoid some the mistakes. Some of the ergonomic

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factors considered during the design of the primary and secondary package are ease of use, segmentation of the market the product is introduced, age of the consumer handling the package and the product, visibility of the product inside the package, pour ability of the product etc. Designers of the product and package also address the intended use of the product and ask questions like as follows:

- Is the pack easily resealed to keep the product shelf life?
- Are there instructions to how to cut the package are easily understood by the consumers?
- Do you understand how the consumers use to try to empty your pack?
- Does your package clearly specify the package storage instructions?
- Is there enough information on the package that the consumers buy the right size?
- Is the product being offered has an environmental conscious consumer and how does the design and material used convey the message?

As information, technology is improving by leaps and bounds, the concept of crowd sourcing of design is getting popular. The designers and their firms are utilizing these tools to take customer feedback to improve their ergonomic designs. A successful introduction of product has many important phases and ergonomics of the product needs to be handled in all key phases, viz.

Ergonomic is one of those crucial elements of a product that we tend to take for granted. This is the main goal and purpose behind ergonomic testing. Finally, ergonomic allows designers to improve in their design. If someone is interacting with a packaging in a way that is unanticipated, but could contribute to the improvement of the packaging, putting that through usability testing is a great way to discover these little changes or improvements. It's also a great way to see what does not work and eliminate potential problems.

2 The Design Research Methodology

2.1 Product Selection Method

5 L edible oil jar were covered during the research design for ergonomic factor considered for packaging.

2.2 Design Process Stage

Design process used during the designing of the ergonomic correct new package for the 5 L edible oil jar products is described in flow chart as below (Fig. 1).

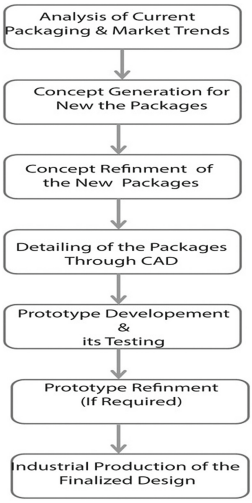

Fig. 1. Flowchart of packaging design process

Stage 1 – Analyzing the current packaging and the market trend of the product reveals the pros and cons of the packaging playing an important role in designing of the new ergonomic correct packages.

Stage 2 – Based on the analysis performed during stage 1 new concept were generated in the form of sketches through brainstorming.

Stage 3 – Sketches are converted into 3D models through computer aided design software are made with detailed specifications of the packages such as length, breadth and height, graphics (designed according to the trends of the product design and the culture of the region), materials to be used etc.

Stage 4 – Prototype samples were made according to the specification decided in the stage 2 and is being extensively tested not only by the packaging point of view, but also by the consumer point of view.

Stage 5 – Further refinement was done in the stage 3 if it is required after getting the test result done in the stage 4.

Stage 6 – The finalized designs were sent to the packaging manufacturing industries for the production after the testing yields the desired result.

3 Field Study and Desktop Study

There are many important considerations, package designers need to keep in mind for an existing and new package. Layer interacting with the product, eliminate over packaging, material substitution needs to be avoided, making it quick to get identified in the shelf, get a connection between the brand and the product, packaging materials, un intended product residue, supply chain visibility, etc. Opening and closing of the package is extremely important, especially for the older consumers where they have issues opening and closing the container, or ability to grab the container.

Field research and desktop study was conducted in order to gather information regarding the current packaging and marketing trends as discussed in stage 1. Different showrooms were visited in order to study the current packaging trends used for the packaging of the product/range of the products as shown in Fig. 2 to understand people's needs and discover opportunities for addressing them. Obtain data for journey maps, personas, use cases, and user stories. Field studies helped to understand users in depth, so that it can be described in a better manner to the other team members.

Fig. 2. Display of 5 L edible oil jar on shelf

4 Ergonomic Study

During the design research sampling profile (Female aged 21–35/SEC "A", "B", and "C") who generally involved in purchasing edible oil of 5 L jar. Following question were asked:

- Convenience on Opening
- Holding/Grip Pattern
- Cap holding and opening experience
- Pouring practices
- Asked consumers to takes us through their kitchen and show how and where they store oil can
- How to pour oil from the can. (pouring process)

Findings for Handling the can (Handle + Grip)

- Sufficient space for fingers in-between the handle and the body is expected.
- Figures should not touch the below surface
- Flat on handle top is considers useful to keep the thumbs on it (grip/support) (Figs. 3, 4, 5 and 6)

Fig. 3. Shows hands grip while pouring

Fig. 4. Shows hands grip while pouring

Handling the can (Pouring +grip)

Fig. 5. Shows Handling the can

Cap Size Observation:

Fig. 6. Cap size

Following observation were taken form sample for size of cap:

- Cap size (1) and l (4) sizes are ok
- Cap size (5) cap size is big
- Cap Size (2) cap size is too small

Following are the observation for opening of cap:

- Full hands are used to open and to tighten the cap (with force)
- When it is smooth after one rotation, fingers are used
- Consumers feel Lesser the rotation of the cap it is easy to open but they don't prefer as they feel kids can open easily.
- Smooth and 3–4 rotation perceived to be good for closing (satisfying the cap is tight) (Fig. 7)

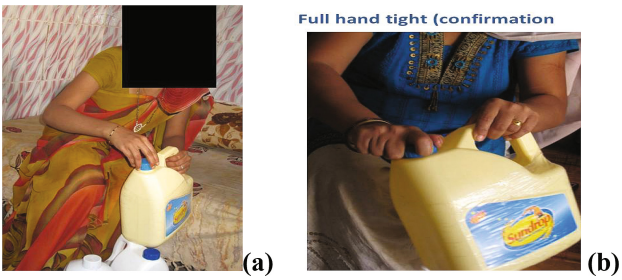

Fig. 7. (a) Shows finger open when its loose and (b)

5 Analysis

In this stage, data gathered and analyzed during the design research which helped to solve problem of consumers through rigorous study of questionnaires and feedback taken from the consumers. Based on the above design research, the following key points were considered for the development of new package.

Handle Grip

- Enough space between handle and body to put fingers easily.
- Handle size should be medium
- Handle surface should be round
- Slant angle handle is convenient to pour Cap
- Cap size should be medium that fits the hand
- Cap should fell tight with at least 3–4 rotations.
- Cap should close full.

6 Concept Generation

In this stage the problems become the objectives and restraints on the situation become the parameters within which the new design were generated. Based on findings of the design research and products were packed (Fig. 8) the concepts generated to be developed are as follows:

Fig. 8. Existing edible oil jar

Product Configuration for Concept Generation. The dimension of the products (Length × Breadth × Height) were measured to develop a soft model with the software for concept generation.

Sketches. Sketches were made based on the outcomes of the study performed above as shown in Figs. 9 and 10.

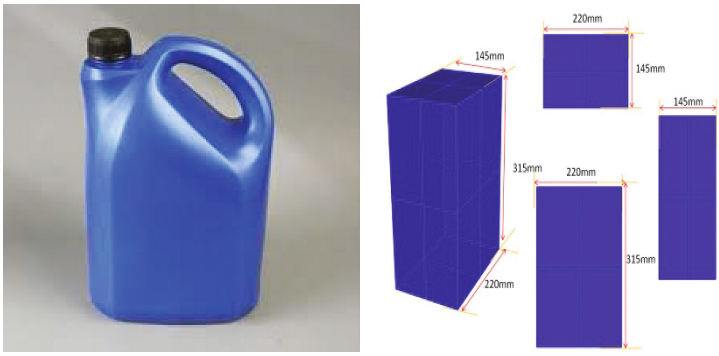

Fig. 9. Product configuration of product

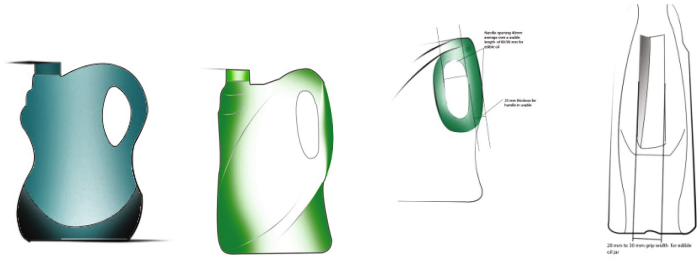

Fig. 10. Initial concept sketches

3-D modeling was done for all the variants with exact measurements with the help of different computer aided design software as shown in Fig. 11.

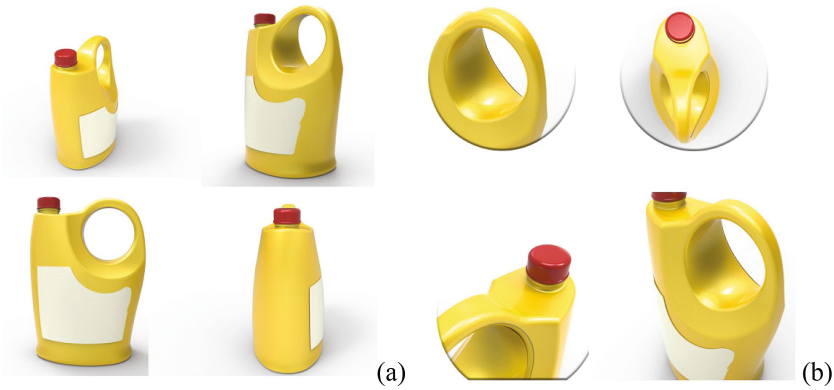

Fig. 11. (a) 3D virtual conceptual modeling and (b) 3D virtual detail conceptual modeling

7 Prototype Development

Virtual prototypes were being developed with the help of CAD and are tried with the virtual products in virtual world to confirm the size, shape, color, graphic suitable for the product (as shown in Fig. 12).

Fig. 12. Virtual 3D prototype

Ergonomic Testing: Based on the virtual 3D prototype a physical mockup sample is made to study the user's usability in terms of holding, carrying comforts as shown in Fig. 13 and accordingly refinement is done.

Fig. 13. 3D prototype for usability testing

8 Package Design

A questionnaire was send to 325 respondent, and 300 responded during survey. Thus respondent rate was 92%. The study included different age group, gender, job and education. There were 12 questions in questionnaire.

From the result obtained and represented in Table 1 shows that 47% consumer strongly agrees and only 3% strongly disagree in respect to the effect of aesthetics on package design elements. In most instances, the aesthetics design elements are meant to appeal to the target market and stimulate consumer purchase behaviour. The rationale is to outwit competitor offerings through unique, beautiful and attractive packaging that stands out of the clutter of thousands of competing products and brands and eventually triggers purchase behaviour. The respondents were overwhelming rated graphics depicted on the packages design for 5 L edible oil jar.

Table 1. Effect of aesthetics on package design element to Influence the Consumer Perceptions

	Frequency	Percent
Strongly disagree	9	3
Disagree	30	10
Neutral	27	9
Strongly agree	141	47
Agree	93	31
Total	300	100

After the creation of a package design, it is very important to verify the ergonomic, to achieve the goal of human requirement to hold the packaging. It is very important to test the ergonomic of a package among people of different ages, genders and demographics.

From the result obtained and represented in Table 2, shows that 47% consumer strongly agrees and only 3% strongly disagree in respect to the Effect of Ergonomic on package design Influence the Consumer Perceptions.

Table 2. Effect of ergonomic on package design Influence the Consumer Perception

	Frequency	Percent
Strongly disagree	12	3
Disagree	24	8
Neutral	24	8
Strongly agree	135	47
Agree	105	35
Total	300	100

9 Technical Data for Production

Technical Drawing. The technical drawing of above package design below in Fig. 14 is prepared to share it with the packaging manufacturing companies in addition with the material specifications to manufacture in mass according to the company's requirement (Table 3).

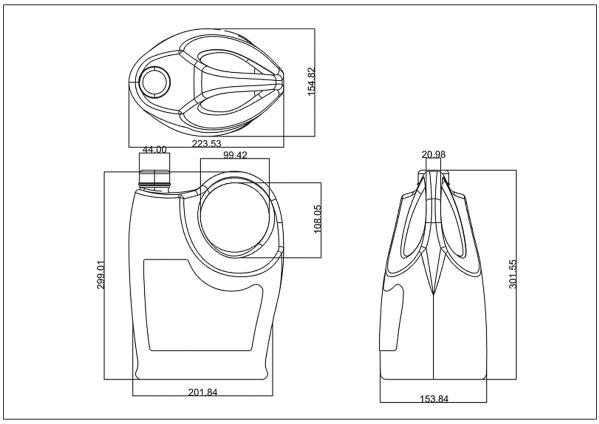

Fig. 14. Technical drawing

Table 3. Technical specification

Particular	Specification	Observation
5 L jar of HDPE material		
Material	HDPE	
Weight of jar	220 gm	210.50 gm
External dimension (mm) (L × W × H)	301 mm × 223 mm × 155 mm	301 mm × 223 mm × 154 mm
Thickness of jar (Micron)	30 (micron)	25 (micron)
Design and drawing	Refer technical drawing section	

10 Conclusion

According to packaging ergonomics the most important part of human's body is hand. Hands interact with every packaging; they touch, carry, hold, open, close and grab it. Anthropometry incase of packaging design concentrates mainly on hand measurements and capabilities. Through ergonomic design process in-depth study was undertaken understanding the hand movements of the consumers in particular area of the Edible oil Packaging. It was also studied the impact of design on consumer's behavior. The study

also revealed the importance of aesthetics, texture, color material and labeling in attracting the consumers towards the product.

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