

MILK PACKAGING DESIGN AND ITS ROLE IN SHAPING CONSUMER RECYCLING BEHAVIOR

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Abstract: In addition to its primary protective role, packaging is increasingly used for marketing purposes, to visually differentiate products from the competition. In modern society, the concern for environmental preservation is becoming more pronounced. One of the challenges is reducing the amount of packaging waste. This can be achieved through the use of ecological materials, educating the population, and recycling existing waste. Packaging design can play a key role in promoting sustainability and environmental protection. Through innovative and ecological approaches, packaging design can contribute to waste reduction, resource conservation, and raising consumer awareness about the importance of preserving natural resources. Education and motivation for consumers to properly recycle packaging are of great importance. This includes informing consumers about the benefits of recycling, as well as providing clear instructions on how to handle packaging after product use to ensure successful recycling. The paper presents the design of milk packaging that encourages consumers to participate in recycling. The goal of the packaging design, which is shown in the paper, is to influence consumer habits regarding environmental preservation. Responsible design, which includes the use of ecological materials and simpler recycling processes, can become one of the key tools in environmental preservation.

Key words: Packaging, Design, Packaging materials, Sustainability, Environment.

1. INTRODUCTION

Milk is a very nutritious food product, rich in carbohydrates, proteins, fats, vitamins, and minerals, but it is highly conducive to the reproduction of microorganisms, which, through their metabolic processes, cause changes. Microbiological changes are generally undesirable and manifest as spoilage, so milk should be protected as efficiently as possible. Milk contains a lot of fat, making it susceptible to oxidative changes, so it should be protected from light and oxygen, under whose influence these changes occur. Light and oxygen also affect the degradation of some vitamins, reducing the nutritional value of the product, and may lead to changes in taste. From this, it follows that the choice of packaging material is crucial for preserving the safety and nutritional value of milk, as well as for protecting the environment.

Even in prehistoric times, man had the need to leave water and collected food for times when he would not be able to find them. The problem was how to preserve the collected food from moisture, rotting, fermentation, drying... Everything that man found in nature and that was suitable for storing and transporting food was used as packaging [1].

Packaging is an inseparable part of a production line, whose purpose is to enable practical and adequate handling of the product, from storage and transportation to the customer, all the way to use by the end user.

In the highly competitive market, which today offers many similar products, packaging no longer has a protective role, but has become a silent seller. Packaging has a significant impact on product appeal, conveying information to consumers and creating a first visual impression. Products are packaged in packaging that will attract the customer. It is of great importance for manufacturers that their product stands out from others. The development of packaging is based on its attractiveness, design and the use of materials that can be successfully recycled [2].

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In today's world, packaging has a key role in influencing product sales. It is more than a protective cover, it is the first contact of potential customers with the product. The first contact is often decisive in deciding whether the product will be noticed, selected and purchased. On the topic of the impact of packaging on product sales, its design, functionality and perception of the consumer's decision and impact on the product's success on the market are investigated [3].

Packaging is a product made of materials of various properties, which serves for accommodation, storage, handling, delivery, presentation of goods and protection of contents[4].

Marketing has a key role in the success of a business. It includes various strategies and concepts that help businesses thrive by effectively reaching their target audience, building relationships with customers and delivering on their promises [2].

Packaging can be used to promote environmental protection and the recycling of packaging waste. By more frequently purchasing products in packaging made from recycled materials or packaging that can be easily recycled, packaging manufacturers would be encouraged to use more of such materials for packaging.

However, this approach requires not only technological innovations but also a change in awareness among consumers and manufacturers. In addition to waste disposal, the production process of packaging materials itself has a significant impact on the environment, often involving the use of non-renewable natural resources and the emission of harmful gases.

In addition to the choice of packaging material, packaging design can influence the mindset of the population and encourage them to contribute to environmental preservation.

2. ECO DESIGN OF PACKAGING IN FUNCTION OF ENVIRONMENTAL PROTECTION

Food is increasingly sold in packaging. According to data from the European Union, about 40-50% of packaging waste comes from food packaging. This percentage may vary depending on the country, but it is clear that food packaging contributes the most to packaging waste. Given the trend of increasing consumption of packaged food, there is also a growing interest in sustainable packaging and the recycling of food and beverage packaging.

Throughout history, milk has been packaged in various ways. For example, glass bottles for milk were introduced at the beginning of the 20th century. As a packaging material, glass has several disadvantages: it is heavy, fragile, and must be cleaned before refilling. In the second half of the twentieth century, other types of packaging for milk, such as cardboard boxes and plastic bottles, appeared on the market. Today, milk and dairy products are packaged in a wide variety of packaging types, depending on the availability of raw materials for packaging materials, the processing equipment available for packaging, as well as consumer habits.

Cardboard packaging is formed in the machine itself immediately before the product is dosed, while plastic bottles for milk packaging are produced in a packaging manufacturing plant, and finished packaging units, ready for filling, are delivered to the dairy.

The system for using returnable packaging involves collecting empty, used bottles and washing them before refilling. Packaging milk in returnable packaging is cost-effective because the packaging can be reused multiple times, and the amount of waste is significantly reduced. However, the use of returnable bottles has a disadvantage in that they must be washed before refilling, which consumes time and energy, and there is a risk of contamination of the packaging before the filling process [5].

Innovations in food packaging can, in some cases, significantly reduce food waste due to the improved microbiological and physical protection provided by the packaging. Therefore, it can be said that the increased use of packaging, in some cases, has an impact on reducing food waste.

In order for the packaging to be used and considered environmentally friendly, it must meet the following requirements [6]:

- The packaging must be health-safe, and its production should, as much as possible, avoid polluting the environment.
- The consumption of packaging should be reduced to the smallest amount technologically necessary; in this regard, ecological requirements take precedence over market-technical and economic ones.
- The packaging should be suitable for recycling.
- Non-biodegradable synthetic materials must not be used for packaging.
- The use of aluminum, foil, or laminated packaging should be minimized, or an alternative suitable solution should be found.
- If possible, the reuse of packaging is recommended.

Discarded packaging significantly contributes to the growing amount of waste generated by households. It is estimated that in Europe, packaging waste accounts for approximately 93% of total household waste. During the Covid-19 crisis in 2020 and the movement restrictions associated with it, household waste continuously increased. This was mainly caused by people spending more time at home, as well as an increase in the number of home food deliveries.

Large companies in the production of milk and dairy products (Nestlé, Danone, Imlek) and packaging (Tetra Pak) state that they are committed to the production and use of sustainable packaging and that they have recognized the benefits of eco-friendly packaging, considering the long-term improvements that its use will bring.

Packaging design that encourages recycling habits involves integrating considerations of collection, sorting, and recycling from the very beginning of the packaging design process. Paper-based cardboard packaging is designed specifically with the purpose of recycling in mind. By increasing the fiber content and reducing the use of plastic and aluminum, the packaging becomes more attractive to recyclers and easier to recycle [7].

Eco-friendly packaging is the most important characteristic of environmentally suitable products and the 'healthiest' alternative to almost all other types of packaging. It is packaging that does not harm nature because it is made from biodegradable materials. In addition to the term eco-friendly packaging, terms such as eco design, green design, sustainable design, and environmental protection design are also used – each of them aims to highlight the importance of using environmentally acceptable materials for product packaging [8].

In order for the packaging to be easily recyclable, it must be completely empty, meaning there should be no food remnants. On cardboard packaging and labels, there are instructions for preparing the packaging for recycling. The design of the packaging can influence the amount of product that remains in the packaging when the consumer empties it [9]. The presence of residual products in packaging materials after disposal can negatively affect the recycling of the packaging material. Residues left on the surface can affect the detection of materials during sorting by infrared radiation devices, thus reducing the efficiency of the sorting process [10].

3. PACKAGING DESIGN AND DISCUSSION

An increasing number of food products are being packaged in eco-friendly packaging, including agricultural products, as well as many other items such as juices, dairy products, biscuits, and other savory and sweet treats. Each packaging material has its advantages and disadvantages. The disadvantages of glass are that it is heavy and fragile, while its advantages include that it can be refilled. Plastic bottles pollute the environment when they become waste because they have a long decomposition period, but their advantages are that they are relatively cheap, not fragile, light, and can be recycled into plastic materials for other purposes. Cardboard packaging is lightweight, and its main component is derived from raw materials that can be easily recycled. PVC bags are the least acceptable packaging because they offer poor protection from mechanical impacts, handling them is

difficult, and the material itself is not environmentally friendly, so they are now rarely used. On the market, cardboard packaging for milk predominantly outweighs plastic and glass bottles.

The following images show the packaging design for three types of milk. The designs feature cardboard packaging, which is biodegradable, and the design of biodegradable labels that are placed on plastic bottles, which can also be recycled. The purpose of the given design is to influence consumers regarding the importance of ecology and the use of eco-friendly materials, as well as participation in the recycling process.

The next three images show the unfolded cardboard packaging in order to display all four sides of the design. Figure 1 shows the cardboard packaging design for almond milk.



Figure 1 – Design of unfolded cardboard packaging for almond milk

Figure 2 shows the design of unfolded cardboard packaging for coconut milk.



Figure 2 – Design of unfolded cardboard packaging for coconut milk

Figure 3 shows the packaging design for cow's milk.

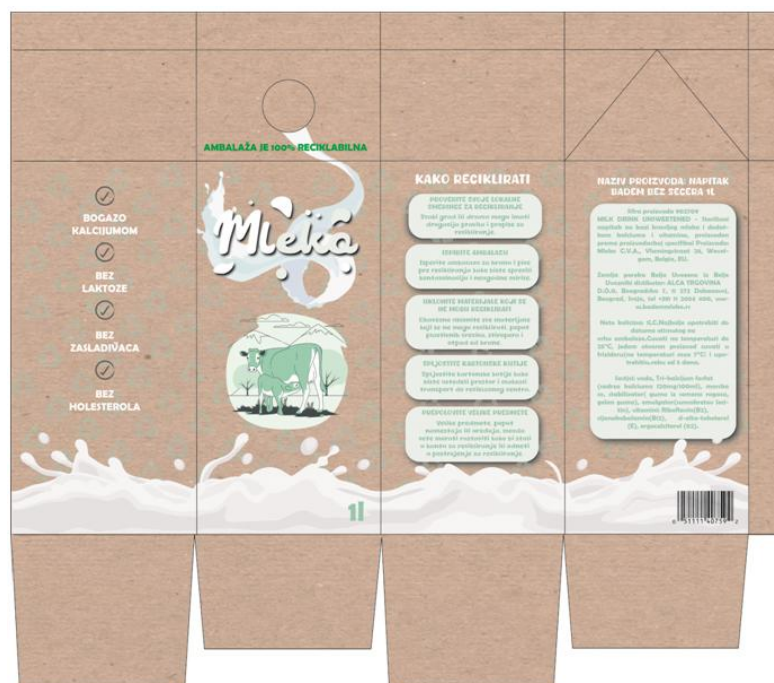


Figure 3– Design of unfolded cardboard packaging for cow's milk

The background uses a texture that shows the packaging is made of cardboard, and at the top of the packaging, there is a message stating that the packaging is "100% recyclable." Recycling symbols can also be seen repeating on it.

On the front side, there is the product name "Ml – eco". "Ml" is colored white, symbolizing milk, while 'eco' is colored differently to distinguish it and symbolize that it is eco-friendly packaging. The illustrations of almonds, coconut, and a cow represent the ingredients of the milk, and the milk pattern is designed as if milk is flowing from the cap. The colors used are natural and evoke an eco-friendly approach.

On the left side, there are labels: "Rich in calcium", "Lactose-free", "No sweeteners", "Cholesterol-free". These labels indicate that the product is tailored for a healthy lifestyle, suitable for people with lactose intolerance or those who avoid sweeteners and cholesterol. On the back of the packaging, there is a detailed 'How to recycle' guide, explaining the process for properly disposing of the packaging, which reinforces the product's eco-friendly message.

At the bottom of the design, there is an illustration of milk in motion, adding dynamism and emphasizing the freshness of the product. The packaging design generally combines natural colors and a minimalist style to highlight the ecological and health benefits of the product, while its aesthetics attract attention on the store shelf.

Figure 4 shows the labels for plastic milk bottles, in which almond milk, coconut milk, cow's milk, and are packaged.





Figure 4– Figure 4 – Label design for plastic milk bottles

The labels, like the cardboard packaging, are made from recycled paper. On the labels, consumers can read the names of the milk, quantities, and some important nutritional characteristics (rich in calcium, lactose-free, cholesterol-free, sugar-free etc.). The design itself is intended to encourage consumers to think about recycling, and the packaging also includes instructions for the proper sorting of packaging materials, washing, and compressing the packaging.

Figure 5 shows milk bottles with the labels displayed above.



Figure 5– Bottles with cow's milk, almond milk, and coconut milk

4. CONCLUSION

Packaging design plays a significant role in raising awareness about environmental protection and promoting sustainable practices among manufacturers and consumers. Through carefully selected design and materials, packaging can contribute to reducing the amount of packaging waste and influence responsible behavior.

Packaging that uses recycled or biodegradable materials minimizes waste and not only reduces the negative impact on the environment but also educates consumers about the importance of

sustainability. Informative labels, clear recycling instructions, and eco-certifications on packaging help consumers make the right decisions and recognize more environmentally friendly options.

Raising environmental awareness through packaging design can have positive effects, including reducing resource consumption, decreasing waste, and changing behavior towards more sustainable solutions. Manufacturers who integrate sustainability principles into packaging design not only contribute to environmental protection but also strengthen their reputation and attract consumers. The effective use of packaging design as a tool for raising environmental awareness can be a significant step towards creating a more sustainable future society and marketplace.

Through the packaging design we have developed and presented in this paper, we aimed to implement elements that encourage consumers to properly recycle, such as clearly labeled materials and simple sorting instructions as a prerequisite for easier recycling. These examples demonstrate how packaging can be an effective tool in promoting sustainable habits.

5. REFERENCES

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