

Challenges and Countermeasures of Daily Chemical Packaging under the Target of "Double Carbon"

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Abstract: This paper provides countermeasures for the achievement of the dual carbon goal of the daily chemical packaging industry. Through the analysis of materials, printing, recycling, publicity design, consumer psychology and other aspects in the design of daily chemical packaging, we find and learn from the advanced use of low-carbon packaging in the whole industry, and put forward countermeasures suitable for low-carbon packaging of daily chemical packaging. The whole life process of daily chemical packaging emphasizes the modern packaging trend with low-carbon development as the main orientation, including production, design and humanistic thinking. Realizing the low-carbon packaging materials, low-carbon packaging printing, packaging recycling, low-carbon packaging publicity orientation and the improvement of industry-related laws and regulations and policies will have a very key impact on achieving the goal of carbon peak and carbon neutrality and building a sustainable society.+

Keywords: Carbon Neutral; Daily Chemical Packaging; Low Carbon Development

1. Introduction

In recent years, China's packaging industry has developed rapidly, and the emissions of carbon dioxide and other greenhouse gases produced in its production process have increased year by year, resulting in the intensification of the greenhouse effect and global warming. In order to delay environmental degradation, it is imperative to reduce CO₂ emissions. In recent years, China has accelerated the green and low-carbon transformation and development. On September 23, 2020, the "dual carbon" strategy was proposed, which incorporated the

"dual carbon" work into the overall layout of ecological civilization construction and the overall economic and social development, and regarded it as an important part of building a beautiful China. The dual carbon strategy advocates improving industrial competitiveness and economic competitiveness by promoting low-carbon technological innovation, continuously promoting the transformation of industrial structure and energy structure adjustment, vigorously developing renewable resources, and taking into account the simultaneous development of economic development and low-carbon development.

2. The Current Situation of the Daily Chemical Packaging Market

At present, low-carbon packaging in the daily chemical market has formed a certain scale. Research reports have shown that today's consumers are more receptive to environmentally friendly products. More than half of consumers are willing to pay more for environmentally friendly products. The low-carbon and comprehensive packaging of daily chemical products conforms to the development trend of the times and is a win-win way to achieve environmental sustainability and industry sustainability.

(1) Daily chemicals are inseparable from human clothing, food, housing and transportation, and the number of packaging required for the production and circulation of daily chemicals is extremely large. The problem of carbon dioxide emissions caused by the production of packaging industry needs to be solved urgently today, when the "dual carbon" goal is proposed. In order to realize the low-carbon development of the packaging industry, the state has launched the "Opinions on Accelerating the Green Transformation of Express Packaging" and the "14th Five-Year Plan" for the Development of Circular

Economy, which put forward requirements for the packaging industry to accelerate the low-carbon transformation of packaging.

(2) Modern packaging materials and packaging technology are constantly upgrading, and packaging forms are becoming more and more diversified. However, the production process of various types of packaging is resource-intensive and produces environmental pollutants. For example, the refining of plastics requires the consumption of a large amount of fossil energy such as oil and natural gas, the manufacture of glass, the smelting of metals, and the process of burning fossil energy to produce high temperature and high pressure conditions, which emits a large amount of greenhouse gases. In addition, the subsequent packaging process will continue to produce carbon oxides, increasing carbon emissions.

(3) The competition among commodity brands in the daily chemical market is fierce. In order to better promote the goods, some merchants rely too much on the improvement of the value of the product by the packaging decoration effect. The packaging materials required and the decoration processes used in this process increase the consumption of energy and resources. The printing process of packaging produces a large amount of volatile organic compounds, which is a big test for the goal of near-zero carbon emissions. At present, there is a relatively complete standard system for the printing and packaging industry in China from materials to machinery and equipment to technology, and there are relatively complete standards in the country, industry and groups. For example, the most influential green printing certification of China's environmental labeling certification is carried out in strict accordance with international standards related to the environment and China's industry standards.

(4) The current approach to low-carbon development is not perfect. The standards and measures that have been established are continuing to take effect for carbon reduction, but the current measures are far from sufficient under the increasingly urgent dual carbon goals. In order to promote China to achieve the goal of carbon peak and carbon neutrality as soon as possible, the daily chemical packaging industry needs to continuously expand the supply of green and low-carbon products in the daily chemical packaging market to meet the

market and environmental demand for low-carbon packaging.

3. Analysis of the Packaging of Daily Chemicals

At present, there are various forms of daily chemical packaging, but the overall packaging life cycle design is neglected. We failed to consider the whole process of production, design and people. The green design of daily chemical packaging should be considered from all aspects of recycling, reduction and reuse, rebirth, adjustment of packaging size, environmentally friendly alternative materials, and correct practices, triggering social responsibility reflection.

3.1 Waste of Resources

At present, there is still excessive packaging in the packaging of daily chemicals, which increases the waste of packaging material resources. Overprinting makes it more difficult to deinking during the reproduction process, such as in the reproduction process of paper packaging. Excessive printing will prolong the purification time of paper fiber and increase the dosage of purifying agent, improve the risk of paper fiber destruction, increase the quality of absorbed ink and impurities, expand the emission of industrial waste, and improve the recycling cost and difficulty of paper packaging waste. The waste of logistics space and the inappropriate packaging size make it impossible to maximize the utilization rate of logistics equipment storage space during logistics transportation. The use of daily chemical products is incomplete, in life, we often have such a dilemma, toothpaste, slightly viscous lotion or ointment, shampoo, conditioner, etc. are always unable to use clean. It's a pity that they are lost, but there is no way to do it. Daily chemical packaging publicity waste, the use of excessive packaging publicity decorative effect will increase the use of complex printing process and mixed forms of packaging materials. This increases the energy and resource consumption of packaging and increases the difficulty of packaging recycling.

3.2 Eco-Unfriendly.

At present, the ecological unfriendliness of daily chemical packaging is mainly manifested in the following aspects. Plastic is difficult to degrade but is the main packaging material in

daily chemical packaging; glass production consumes a lot of energy and transportation quality, which expands the carbon emissions in the production and transportation process; the high cost of metal recycling is not conducive to the formation of a low-carbon model; a large number of paper materials consume too much wood and water resources, which is not conducive to the protection of water and forest resources, and the environmental adaptability of paper packaging is poor and easy to damage. The packaging production process will produce a large number of greenhouse gases, causing air pollution, expanding carbon emissions and aggravating the greenhouse effect. The discharge of waste water from the packaging industry will also cause great harm to human health and the natural environment. Volatile solvents in printing inks produce toxic gases that cause air pollution and endanger human health, and the packaging design of daily chemical products does not consider the whole life cycle of packaging, and the service life is too short, and it becomes waste after a use. Mixed packaging formats with multiple materials make it more difficult to recycle packaging.

4. Countermeasures for Packaging Design of Daily Necessities under the Background of "Double Carbon"

Product packaging plays an important role in consumer decisions, with logos, colors, placement, and other design elements influencing consumers' purchasing choices. In the context of a green and low-carbon oriented society, the impact of packaging on the environment has begun to become a factor affecting consumers' preferences. We use low-carbon technologies to improve the environmental benefits of our packaging. On the premise of satisfying the basic functions of packaging, low-carbon packaging materials are used, packaging process means are upgraded, packaging structure is optimized, and packaging decoration design is simplified. We need to increase the recycling rate of waste packaging, promote the degradability and recycling of packaging waste, and implement the concept of low-carbon packaging. By targeting the market according to market demand, we can reduce the consumption of packaging resources and reduce the retention of carbon footprint.

4.1 Low-carbon packaging materials for daily chemicals

(1) We need to promote the use of renewable and environmentally friendly materials to reduce the environmental impact of packaging production. We use natural organic materials such as bamboo and grass that have a short growth cycle, fast growth rate, and strong renewability, instead of cutting down forest wood to make raw materials. This will help alleviate the problem of reduced carbon cycling capacity due to reduced forest cover. For example, (Figure 1) the packaging is made of renewable and environmentally friendly materials composed of coconut shells and minerals, which is novel and simple in appearance, simple and elegant. It can be similar to traditional plastics in function, light weight, easy to print, far better than traditional plastics in terms of environmental protection, rich in materials, easy to degrade naturally, and protect the environment from the pollution of traditional plastic incineration. Promoting the application of pulp molded products in daily chemical packaging can replace other packaging materials and containers with low recyclability. Pulp molded products are made from recycled paper, which increases the recyclability of daily chemical packaging while improving resource utilization.



Figure 1. Low Carbon Packaging Made of Coconut Shells and Minerals

(2) We should actively develop new degradable materials to reduce the impact of packaging waste on the environment. Synthetic polymer materials such as plastics are difficult to degrade naturally after being discarded, and their raw material oil will also produce a large amount of carbon dioxide in the production process, which seriously harms the environment. Biodegradable materials can be disposed of together with household waste.

After landfilling, they are returned to nature in the form of compost. By adding photosensitizers, modified starches, biodegradants and other raw materials that can reduce the stability of traditional plastics on the basis of traditional plastics, their natural degradation is promoted and environmental pollution is reduced. Bioplastics made from newer biomass sources, such as cornstarch, sawdust, recycled food waste, and vegetable fats and oils, are repurposed to reduce biowaste. We promote water-soluble packaging materials, such as laundry pods, which do not produce packaging waste at all, and their lighter weight reduces the cost of transporting products.

(3) Streamlining the use of packaging materials and making the materials used in product packaging as simple as possible can reduce the difficulty of packaging recycling. This makes it easier to recycle the packaging. Take the most common pump head in the bottle container assembly of daily chemical packaging as an example, the pump head is the most complex part of the package, and it is also the most complex part of the packaging with the most complex materials, containing a variety of different plastic combinations, which are difficult to disassemble and recycle. Packaging recycling is the process of separating and reusing different kinds of packaging materials, and these different kinds of plastics must be separated. Therefore, reducing the use of packaging materials as much as possible will facilitate packaging recycling.

(4) We can optimize the packaging structure, reduce the weight and lightweight the design.



Figure 2. Packaging Design of Toothpaste with No Dead Corner

On the premise of not affecting the strength of the packaging structure, the consumption of packaging materials is reduced by reducing the

thickness of the packaging container and optimizing the packaging function. The new UDN integrated tube integrates the hose cap and pipe body into one piece, which saves the overlap between the traditional pipe body threads and the pipe cap threads, and reduces the thickness of the pipe wall, effectively reducing the use of plastic. Compared to traditional tube packaging, the plastic reduction rate is up to 55%. Colgate's hanging toothpaste tubes eliminate the carton and make the toothpaste tubes available for hanging sale. While facilitating sales, it reduces the use of materials for outer packaging cartons. Hose-based products can be packaged in this way to optimize the packaging structure design and reduce the consumables of the outer carton packaging.

We can simplify the number of packaging layers and optimize the packaging layer relationship. Some products are strong on their own and do not require excessive packaging protection. They only require a simple product introduction and publicity. We remove unnecessary packaging layers for such products, and carry out more concise packaging methods without packaging or bare packaging, reducing the consumption of packaging materials. Reducing the volume of logistics can achieve higher logistics and transportation efficiency in the effective space. Appropriately reducing the volume of logistics packaging can improve the utilization rate of logistics transportation and product stacking space, and reduce the storage cost of product storage and stacking in logistics and the cost of logistics and transportation. Reducing the waste of daily chemical products, such as the packaging design of toothpaste without dead ends (Figure 2), greatly reduces the waste of products during use. In the face of the dual carbon goal, the packaging design adheres to practicality as the main goal, so that the product packaging tends to be lightweight and simplified.

(5) Extending the life of packaging can be used to promote the concept of sustainable packaging. Packaging with high resistance strength can effectively reduce the possibility of product damage during transportation and circulation, and reduce the waste of resources and financial losses caused by product damage. Longer packaging life can improve the ability of packaging to be reused, resulting in fewer

packaging iterations. We can reduce the amount of packaging waste, reduce the need for new packaging production, reduce the use of packaging materials, and thus reduce the need for carbon emissions. More diversified packaging functions can also extend the service life of the packaging and increase the secondary value of the packaging. Edible straws, wrappers, films, and other packaging supplies are already on the market, and promoting this type of packaging will effectively reduce the amount of packaging waste. For example, there is a sandwich wrapper made from seaweed that can be eaten at the same time as the sandwich is eaten without packaging waste, and the Mexican company E6PR produces a six-pack of beer rings made from wheat and barley residues from the beer brewing process. This type of packaging can not only be eaten by us humans, but can also be easily "eaten" by nature even if it is discarded, or become a delicacy for animals.

4.2 Low-Carbon Packaging and Printing of Daily Chemicals

(1) Break the barriers between packaging and decoration design demand and packaging production demand, and realize low-carbon packaging and decoration. From the perspective of packaging design process, packaging designers are more interested in aesthetics and innovation in packaging marketing, while manufacturers pay more attention to product quality and production capacity. The difference between the two pursuits has led to cognitive gaps and barriers between packaging design and manufacturing. We need to break the status quo of separation between packaging design and manufacturing, reduce the loss of understanding of product information and reduce communication costs between both parties, control the overall budget and product packaging costs, and improve product quality control capabilities, so as to reduce the ineffective resource loss and carbon increase caused by the different pursuit of packaging.

(2) Form a simpler, more efficient, more novel and more breakthrough low-carbon daily chemical packaging and printing style. Just like Muji's daily chemical packaging, it has been conveying the concept of low-carbon and environmental protection to consumers in a

simple form. Adhering to the minimalist style of less is more, it can reduce the color of packaging printing and simplify the packaging printing content, simple but not simple. Reducing the color used in packaging printing can greatly reduce carbon emissions; The implementation of electronic labels, the removal of PET plastic labels, label-free printing will be more low-carbon and environmentally friendly; Promote new packaging without printing and ink, and remove excess ink printing content; Laser technology is used to print the necessary information such as product names and production dates, reducing material use and energy consumption. Development of new inks and adhesives as well as recyclable label materials. For example, washable adhesives can be removed during recycling, which can promote label recycling, reduce the number of label printings, reduce material usage, and increase the life cycle of printed packaging.

(3) We should use environmentally friendly inks and printing colors with sustainable characteristics. For example, soybean based ink, which has been used for packaging in recent years, has the advantages of biodegradability and no harmful emissions, and in terms of cost and waste, plant-based ink is also more efficient and practical in some materials. The value of recyclable packaging gradually decreases with the number of times it is reused. An important reason for this is the limitation of the pigments available. For example, if a red cosmetic bottle is recycled, it can only turn black if it needs to be dyed again, and black plastic is not conducive to recycling because its color is not conducive to the identification of optical scanning recycling facilities. Therefore, when designing, we should choose transparent colors as much as possible (as shown in Figure 3) to improve the possibility of recycling and reusing packaging.



Figure 3. Example Display of Transparent Packaging that is Easy to Recycle and Reuse

(2) We should upgrade reusable packaging and improve the ability of packaging to be reused. Such as kraft paper packaging, molded pulp, foam and recycled plastic and other packaging materials that are easy to recycle and recycle, strong recyclability, simple recycling process, low recycling cost, easy to recycle packaging waste into new packaging materials through the packaging waste recycling process. We need to upgrade and promote the application scenarios of this type of packaging, so that more products can use this type of reusable packaging, and improve the recycling rate of packaging waste.

(3) Shift recycling to collection and reshaping into new packaging. We should Expand the way packaging is reused. For example, some daily chemical companies have opened a business model of reuse and refilling, so that customers can return the original packaging for refilling at a discounted price. The use of refills and repacks (Figure. 4) shows that refills can reduce material usage by up to 40% compared to standard packaging, based on packaging test data. For example, consumers buy refills in simple bags that are different from standard packaging, and add them to standard packaging to continue to use. The lower price advantage of refills compared with standard packaging will attract consumers, help to increase the repurchase rate of single products, improve the brand stickiness of consumers, and provide producers with higher benefits.

(4) Actively carrying out cooperation between enterprises can improve the efficiency of recycling daily chemical packaging waste. In each brand store or by the brand jointly set up a special collection point or set up a daily chemical recycling bin, to carry out daily packaging recycling work. The joint establishment of collection points by daily chemical enterprises can reduce the cost of setting up collection points and the cost of operating personnel. We should actively promote the initiative of independent cooperation between daily chemical enterprises and environmental protection units. The government formulates mandatory packaging recycling regulations, provides policy or financial support for enterprises that independently carry out recycling cooperation, improves the enthusiasm of enterprises for packaging recycling and carbon reduction

actions, reduces the difficulty of small brands to carry out individual daily chemical waste recycling, and promotes the development of waste recycling activities. We can achieve a good situation promoted by the government, driven by enterprises, and acted by the whole people, and jointly promote the circular development of the economy.



Figure 4. Supplementary packaging reduces plastic usage

4.4 Optimize the Publicity Orientation of Daily Chemical Packaging and Reduce Carbon Footprint

(1) Guide consumers to pay attention to the function of goods and reduce the carbon increase caused by excessive packaging. The packaging of daily necessities is rich and complex, and the marketing strategies of manufacturers are also dazzling. In the face of such a rich market environment, it is easy for consumers to ignore the consequences of various packaging, become blind and impulsive, and will buy excessively "exquisite" packaged goods because of comparison. Increase the publicity of green packaging, deepen consumers' awareness of the consequences of bad consumption, and change people's consumption concept to pay more attention to their own needs and whether the products meet the needs of green and low-carbon. In the packaging design, consciously display and label the carbon value of the product packaging to consumers, which can guide consumers to buy and use reusable packaging and utensils, and help consumers reduce their carbon footprint.

(2) Integrate the effect of green and low-carbon packaging and expand the publicity capacity of green daily chemical packaging. In large shopping malls or supermarkets, it is common to see a series of packaging composed of different types of goods and a combination of several different

types of functionally related products in one package. Manufacturers in the production of different products of the same brand with the same icon, container shape and so on to form a unified visual image, the same brand of products in a large number of ways to effectively improve the brand effect, in the enhancement of advertising effect at the same time to bring convenience to consumers and more affordable purchase experience. We advocate the active use of integrated publicity methods, strengthen the collection of green and low-carbon packaging methods into a distinctive brand style, and expand the public's choice of low-carbon products.

(3) Enterprises form a low-carbon publicity style and coordinate the sustainable development of enterprises and environmental sustainability. For example, Procter & Gamble's Beauty Division promotes the five guiding principles of safety, quality and effectiveness, sustainability, equality and inclusion, and transparency, L'Oréal's "Beauty for All" declares its strategic commitment to every link of the value chain, from R&D to operations, and Shiseido's "Beauty Innovation for a Better World" focuses on the sustainable development of the environment, society and culture. Enterprises should comprehensively promote the low-carbon publicity style, make the low-carbon publicity method become the development advantage of the daily chemical packaging industry, form the development scale of low-carbon packaging, and drive the low-carbon development of other industries.

4.5 Improve Regulations and Policies Related to Low-Carbon Development

We should improve relevant laws and regulations to promote the advancement of China's "dual carbon" goal. Take refills as an example, the use of refills is more common in foreign countries than in China. This is due to the fact that there is no limit on the weight of packaging materials in our country. In Japan and some European countries, taxes are levied based on the weight of the package. Large-capacity containers usually have a heavier weight, and the introduction of taxes will increase the cost of production significantly, and the price of the product will also increase significantly. Therefore, through the establishment of some laws and regulations, the use of low-carbon packaging forms and the

selection of low-carbon packaging methods have more economic advantages, so as to promote low-carbon development.

Government departments help enterprises to carry out publicity and promotion, and attract customers to enterprises that actively carry out the "double carbon" action to improve national recognition. In the era of big data, the thing that the state pays attention to is traffic hotspots. Government departments encourage companies to carry out waste packaging recycling activities. Priority will be given to large enterprises with influence, and other small and medium-sized enterprises will be driven to work together to recycle waste packaging. It enables enterprises to contribute to the "dual carbon" goal and at the same time build brand awareness for enterprises. At the same time, the price of low-carbon products will be controlled to increase the public's enthusiasm for purchasing environmentally friendly products. While the public will be willing to pay for products and brands with social value, exorbitant product prices can discourage consumers. In the short term, brands need to bear some of the costs of sustainable packaging. Today's consumers cannot afford an exorbitant premium on goods, but will choose environmentally friendly products at the same price.

5. Conclusion

The "dual carbon" goal is not only a challenge for China's daily chemical packaging industry, but also an opportunity for the transformation and development of the industry. Packaging design can not only achieve carbon reduction in production, but also need the goal results of production, design and human environment. It includes recycling, reduction and reuse in production, rebirth, adjustment and substitution in design, as well as correct practices, social responsibility and phenomenon reflection in the human environment.

Packaging designers should consider printing design, material selection, market exploration, and waste recycling to act as low-carbon and environmentally friendly propagandists. Merchants pay attention to the quality of goods, avoid excessive packaging, use environmentally friendly materials to make environmentally friendly packaging, reduce packaging, and promote goods in a green way.

Consumers should understand the importance of green environmental protection, cultivate the concept of green consumption, actively purchase green packaging products, and cooperate with the recycling of packaging waste. We will actively develop carbon capture and carbon cycle technologies. Through the above methods, unnecessary resource consumption will be greatly reduced, the problem of excessive carbon emissions caused by fossil energy combustion will be reduced, the problem of carbon cycle capacity will be reduced, and the goal of carbon peak and carbon neutrality in China will be promoted.

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