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Analysis on the Development of Cigarette Packaging in the Era of Intelligence

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Abstract: China is one of the biggest countries in cigarette production and sales, therefore it is important to improve the quality and efficiency of cigarette production. As cigarette packaging is an important part in cigarette production, therefore, it is important to strengthen research on improving the quality of cigarette packaging. This article summarizes the development process of cigarette packaging in China, introduces the development of printing technology in the era of intelligence, summarizes the application of printing technology in cigarette packaging, analyzes and explores the development trend of cigarette packaging in the era of intelligence, with the hope to provide reference for practitioners.

Keywords: Intelligent era; Cigarette packaging; Printing technology; Development trend

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1. Introduction

In recent years, with the advancement of science and technology, China has entered the era of intelligence. In this context, printing and intelligent technology are deeply integrated, various advanced cigarette printing processes are widely used, and the cigarette packaging industry has achieved great development. At present, the scale of China's cigarette packaging enterprises continues to expand, and cigarette packaging products are developing in the direction of functionalization, diversification, and individualization. Therefore, in the era of intelligence, cigarette packaging could achieve greater development.

2. Development course of Chinese cigarette packaging

Cigarette is a special product with certain controversy. The main function of cigarette packaging is to protect internal products and promote sales, and it also has the function of spreading regional cultural characteristics. China's cigarette packaging has a long development history. After years of development, the quality of packaging and printing and the cultural connotation of packaging have been significantly improved. According to research data, British American Tobacco established a cigarette factory in Shanghai in 1902, and successively launched cigarette brands such as Sanpaotai, Daqianmen, Hardemen, and Laodao with the unique, novel, and cultural cigarette package with the market share exceeds 50%. In response to the impact of foreign brands on China's cigarette market, the Nanyang Brothers Tobacco Company was established in Hong Kong in 1906 and launched cigarette brands such as Magpie, Great Wall, and Double Happiness, but the overall market feedback was not good. To a certain extent, the packaging design of domestic cigarettes in China is influenced by cigarette packaging of foreign brands. The brand name and packaging style are similar to those of foreign brands, resulting in a low market share of domestic cigarette brands [1]. After the founding of New China, China's Tobacco has made great progress and has

become the largest cigarette manufacturer in the world. Cigarette packaging has also resisted cheap development and developed into a packaging model that integrates new materials, high technology, and anti-counterfeiting measures. The printing method of the cigarette packaging is hand-drawn, and it has gradually transformed into advanced surface treatment solutions such as silk screen printing, offset printing, and bronzing [2]. Entering the era of intelligence, China's cigarette packaging industry has vigorously strengthened technology research and development, and actively applied intelligent technology in the fields of cigarette packaging structure design and information integration. The functions of cigarette packaging have gradually expanded its promotion and protection to customer service, product protection, and information data integration and other functions.

3. Development of printing technology in the era of intelligence

Currently, information Internet and digital technology are becoming more mature and perfect, and smart phones become popular, impacting the printing industry to a certain extent, and the business volume of some enterprises has dropped significantly. Therefore, packaging printing technology has gradually established a new development channel through the integration of intelligent technology and process innovation. Additionally, it is also essential to realize the needs of consumers, who are increasingly diversified and personalized. Therefore, cigarette packaging should not be limited to the cigarette product itself, but also should provide customers with personalized services, improves their consumption experience, and complete the packaging through packaging. The collection of product-related data enables product traceability, improves the anti-counterfeiting function of products, and makes packaging more environmentally friendly [3].

4. Application of printing technology in cigarette packaging

Different from other product packaging, cigarette packaging needs to comprehensively use information technology, high-tech materials, packaging design technology, printing technology, and other high-tech technologies to improve the quality and delicacy of packaging. The printing process is the core process of cigarette packaging. The traditional cigarette packaging printing process mainly includes pre-printing graphic processing, plate making, printing, post-printing processing, die-cutting finished products, etc. Entering the era of intelligence, the printing technology of cigarette packaging is gradually updated and perfected, the digital workflow is integrated into the pre-printing graphic processing, and advanced technologies such as color management technology, sensing technology, and automatic control technology are added to printing system-level related equipment, and gradually formed an industrial system composed of flexo, offset, gravure, screen, digital printing, etc., and the overall level of cigarette packaging printing has been significantly improved.

4.1. Offset printing

Offset printing is widely used in cigarette packaging printing. Its main feature is to use the basic principle, which is water and oil cannot be mixed. The graphic information on the offset printing is transferred to the top of the substrate using a blanket to achieve a good printing effect. In the offset printing mode, the graphical information is lipophilic, other parts are hydrophilic, and the layout is flat. Applying it to cigarette packaging printing can ensure the printing quality, enrich the packaging color, and allow the packaging image to look more layered. It has a higher printing efficiency, and helps to increase the overall sales of cigarettes [4].

4.2. Gravure printing

The main feature of gravure printing is that the ink is placed inside the graphic printing plate with a concave

surface, and the content of the relevant printing plate is printed on the substrate by embossing. In the gravure printing process, the depth of the depression of the printing plate can affect the thickness and layering of the printing. If the depression of the printing plate is shallow, the printing result will have a shallow ink layer, otherwise deep ink layer can be achieved [5]. Gravure printing ink has a high degree of running-in, bright colors, good layering, relatively stable printing quality, high printing efficiency, and durable printing plates. It is suitable for packaging and printing of cigarette products with large sales volume.

4.3. Flexographic printing

A flexible resin photosensitive plate is required for the flexographic printing process. The operator uses an anilox roller to transfer ink to complete the printing, but a printing plate with protruding graphic information is used during printing, so it can also be regarded as letterpress printing. Flexographic printing uses a flexible resin photosensitive plate with a thickness of 1-5mm. The ink layer formed after printing is thicker, but the color is relatively stable, and the ink used is green and environmentally friendly. The overall printing efficiency is high. It is widely used in packaging, and the tobacco industry mostly uses flexographic printing solutions in carton printing [6].

4.4. Screen printing

Screen printing mainly uses a screen-printing plate to complete related operations. The ink can pass through the mesh of the graphic part of the printing plate, and the graphic and text can be printed on the substrate through a semi-automatic scraper or manual operation. The thickness of the screen-printing ink layer is about 30-100 μm, which is obviously higher than other printing schemes. The printing effect has a strong three-dimensional and tactile effect, and can present the surrounding and ice effects, which can be significantly improved the grade of the product when it is applied to cigarette packaging printing.

4.5. Digital printing

Digital printing is a relatively advanced printing method. During the printing process, the graphic information which is stored in the computer needs to be converted into data, and the printing equipment can complete the printing after receiving the data. Compared with other printing methods, digital printing integrates advanced technologies such as electronic technology, computer technology, network communication technology, and printing technology. In this printing method, printing plates are not required during the printing process, and can dynamically adjust relevant data, and complete the printing of full-color images at one time. At present, the digital printing technology is immature, its stability is low, and its production efficiency needs to be improved. The main application of this printing method is in the printing of small batches of cigarette packaging and the printing of cigarette packaging samples. However, this technology can significantly shorten the time-consuming research and development of cigarette packaging, therefore it has good application prospects [7].

4.6. Post-printing treatment

After cigarette package is printed, it is essential to implement processes such as varnish, bronzing, die-cutting, and embossing treatment. Through the above-mentioned processes, the quality of the cigarette package can be improved, the package can have anti-counterfeiting functions, and the added value of the cigarette can be increased. In the era of intelligence, cigarette packaging printing technology and the post-printing process gradually becoming matured and perfect. For example, traditional varnish process has been developed into a reverse glazing process, and the bronzing process has been developed into cold stamping, cat's eye bronzing, laser micro-engraving bronzing, holographic anti-counterfeiting bronzing, etc. No matter what kind of post-printing treatment process is used, the purpose is to improve the quality and

aesthetics of the packaging. Overly complicated post-printing treatment process will lead to longer packaging time, higher packaging costs, and increased waste rate of cigarette products. Therefore, it is recommended to use relatively complicated post-printing processing technology to medium and high-end cigarette products, and to adopt conventional technology for ordinary cigarette products.

5. Development trend of cigarette packaging in the era of intelligence

5.1. Application of digital anti-counterfeiting technology in cigarette packaging

Cigarette packaging contains many functions, among which anti-counterfeiting is one of the important functions. The main purpose of cigarette manufacturers applying various new technologies and processes to cigarette packaging is to improve the technical content of packaging so that other cigarette manufacturers are not easy to imitate, and then realize the effective protection of the brand of cigarette products. At present, the anti-counterfeiting technologies commonly used in cigarette packaging mainly include process anti-counterfeiting technology, material anti-counterfeiting technology, digital anti-counterfeiting technology, etc. In the era of intelligence, the application of network technology and computer technology provides a new development direction for cigarette packaging anti-counterfeiting technology. First, radio frequency identification (RFID) technology. RFID technology is radio frequency identification technology, which uses microwave or electromagnetic waves as the medium, and completes the automatic identification through interconnection and communication in a non-contact state. Some unscrupulous merchants sell counterfeit tobacco products in order to seek profits. Consumers could not completely identify genuine or fake products simply by observing the outer packaging. Adding RFID technology to cigarette packaging can identify effectively the tobacco products, thereby protecting enterprises and consumer interests. The introduction of RFID technology in cigarette packaging can track and record the production, storage, logistics, and sales process of cigarette products in all-way round, and can assist in the establishment of a product traceability system, and reduce the flow of counterfeit products into the market [8]. Second, the implementation of unique anti-counterfeiting code technology in the cigarette packaging production. The main feature of the unique anti-counterfeiting code technology is that it converts cigarette-related information into a two-dimensional code with digital printing technology, and sprays it on the top of the cigarette package. This two-dimensional code is a unique identity of the cigarette product, which allow product traceability with anti-counterfeiting functions. The unique anti-counterfeiting code technology adopted by cigarette manufacturers can realize the tracking management of the whole process of product production and marketing, which can ensure product quality and avoid counterfeit products. At present, this technology has been applied in many tobacco manufacturers and has achieved good application results.

5.2. Intelligent interactive printing of cigarette packaging

At present, China has entered the era of intelligence. Consumers generally tend to obtain the information that they need through video, live broadcast, electronic information, etc. The development of intelligent technologies such as virtual reality (VR), augmented reality (AR), and Mixed Reality (MR) has made the cigarette packaging industry present the development trend of intelligent mobile printing. Firstly, VR is a collection of advanced technologies such as multimedia technology, simulation technology, computer graphics technology, and sensing technology allowing people to receive an immersive experience. Secondly, AR which use smartphone's camera to scan the item, and use image recognition technology to obtain the dynamic image and three-dimensional structure model of the item. Through the common fusion of virtual and reality, it can provide consumers with rich product information, thereby satisfying the diversification of consumers needs [9]. Thirdly, MR is an interactive technology that integrates virtual scenes and reality. Consumers can enter the connection point through MR equipment and freely adjust the virtual and real states. In the era of intelligence, the above-mentioned technologies need to be reasonably integrated into

cigarette packaging, thereby consumers can obtain a good visual experience and fully understand product information.

5.3. Cigarette packaging green printing

Green printing is a brand-new cigarette packaging printing concept, not just a certain printing technology, its main feature that it involved in the whole process of cigarette packaging printing, including raw materials, growth and processing, sales, recycling, etc., follows the concept of green environmental protection, save resources, and reduce the impact on the ecological environment. The author believes that the development trend of green printing on cigarette packaging mainly includes the following two aspects. Firstly, environmentally friendly injection molded parts are used in cigarette packaging boxes. Adding environmentally friendly injection molding parts to cigarette packaging can improve the forming effect, increase the stiffness of the package, and avoid environmental pollution caused by traditional cardboard packaging. At this stage, the packaging of high-end cigarette products such as Double Happiness Jin Guoxi and Nanjing Jiuwu Zhizun are all added with environmentally friendly injection molded parts. Among them, Nanjing Jiuwu Zhizun uses 0.9mm open-molded environmentally friendly injection molded parts to replace white cardboard and wrap the facial tissue over the environmentally friendly injection molded parts, and set the butter paper as the surrounding bar. The stiffness and flatness of the package are much better than the traditional package, and it can also save paper and reduce the pollution to the ecological environment [10]. Secondly, cigarette packaging is printed without ink. Inkless printing of cigarette packaging mainly adopts advanced technologies such as laser writing, electron beam, electrochemistry, holographic technology, and precision numerical control processing, so that the nanostructure formed by digital weaving is presented on the surface of the substrate, and light such as reflection, scattering, and diffraction can be generated after printing to change the color rendering effect. Inkless printing does not need to use ink and paper, and uses electronic technology and laser technology to complete a specific printing. Some cigarette companies have applied this technology to design product packaging and other fields, and achieved good results. In the future, this technology can also be applied to a large-volume cigarette packaging printing.

5.4. Rationalized and personalized packaging

In the era of intelligence, people's consumption concepts have changed significantly, and rationalization has become a new demand for consumer. Therefore, cigarette packaging companies need to change their concepts, clarify the relationship between cigarette packaging costs and product quality, appropriately simplify packaging and printing solutions, and choose more cost-effective products. Printing materials can reduce the cost of cigarette packaging and improve the environmental protection of cigarette products. At the same time, it is also necessary to pay attention to the individual needs of consumers in the printing of cigarette packaging, develop packaging according to the characteristics of consumer groups, improve the visual impact, and individual characteristics of products, to fully stimulate consumers' desire to buy the product and eventually increase the product sales.

6. Conclusion

In the era of intelligence, technologies such as the Internet, cloud computing, and the Internet of Things are increasingly widely used, and the pace of technological change is accelerating under the leadership of emerging electronic technologies. Facing the new social development situation, cigarette packaging companies have changed their development concepts, strengthened technology research and development, integrated digital anti-counterfeiting technology, intelligent interactive technology, and green printing technology into cigarette packaging, and paid attention to the rationalization and personalization of cigarette packaging to meet the diverse needs of consumers and promote their own stable and healthy development.

Disclosure statement

The author declares no conflict of interest.

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