

Planning and Design of Logistics Distribution Center of Tobacco and Cigarette Corridor

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Abstract. With the vigorous development of tobacco industry, perfect logistics distribution system is needed as a strong support, so scientific and reasonable planning and optimal design of cigarette logistics center have far-reaching influence on the development of the whole tobacco industry. This paper mainly analyzes and discusses the planning and optimization design of cigarette logistics center, starting with the early positioning and construction of the logistics center, analyzes the existing problems in the planning and design of cigarette logistics center, and puts forward effective solutions for its shortcomings in order to contribute to the logistics development of tobacco industry. The planning and optimization design of cigarette logistics center should focus on information construction to realize electronic and digital tobacco. Pre-construction is related to post-operation, and post-optimization is related to high-quality management and high economic benefits of enterprises, and the whole process is closely linked. The planning and optimization design of cigarette logistics center should reflect economy, practicality, high quality and high efficiency, and be realized by means of scale, standardization, specialization and information construction.

Keywords: tobacco; Cigarette corridor; Logistics distribution center; Planning; design.

1 Introduction

The development of a country's logistics industry largely depends on the proportion of logistics costs to the total GDP. The larger this proportion, the more backward the logistics development level of the country is; Delivery is an important activity in logistics, and delivery costs account for a large proportion of logistics costs. Effectively reducing delivery costs can lower logistics operating costs; Assembly and delivery are important links in distribution activities. On the one hand, selecting vehicles with appropriate capacity for effective assembly not only maximizes the use of vehicle space and load capacity, but also improves distribution efficiency and saves logistics costs; On the other hand, choosing a suitable delivery route for delivery can save delivery time, reduce vehicle road occupation, and thus reduce resource waste[1].

Tobacco belongs to the national monopoly industry and is also one of the important pillar industries of the national economy. The huge production and sales of tobacco are important components of the national and government fiscal revenue. Logistics activities, as an important link in the production and sales of cigarettes, play an important role in the tobacco

industry and national economic development. The traditional cigarette logistics in China has the characteristics of "scattered business, low organization, and extensive management". Since China's accession to the World Trade Organization (WTO), cigarette logistics has entered a new period of rapid development. In 2002, it was required to realize the concept of "telephone ordering, online distribution, electronic settlement, and modern logistics"; In 2006, the country proposed the construction of a modern logistics system to meet the requirements of industry reform and the development of the times; In 2007, emphasis was placed on the importance of optimizing internal resource allocation and promoting integrated business operations; In 2008, the requirement of "promoting industrial and commercial integration and building high-level logistics" was proposed, aiming to achieve "from enterprises to industries, from sales to supply" as soon as possible the transformation of logistics operation mode; Nowadays, in order to improve the logistics level of the tobacco industry, relevant departments are working hard to build the Internet of Things for Chinese cigarettes[2]. So far, there are approximately 100 delivery points for domestic tobacco industry production, with over 300 prefecture level cigarette companies and commercial cigarette sales companies, and cigarette retail customer points exceeding 5 million. Therefore, the logistics operation of the current cigarette industry system and commercial system is relatively independent, with a relatively scattered logistics network and nodes, and a relatively wide coverage. The development of domestic cigarette logistics is rapid. On the one hand, a large number of cigarette logistics distribution centers have been completed. As of 2010, there are approximately 80 newly built (including some large-scale expansion) cigarette logistics distribution centers at the prefecture level in China; On the other hand, the software and hardware equipment facilities of cigarette logistics distribution centers have been greatly improved, and logistics information technologies such as Electronic Data Interchange (EDI), Radio Frequency Identification (RFID), or Electronic Labels (RFID) have been widely used, forming a "one warehouse distribution, business integration" operation model. Although cigarette logistics distribution centers have developed rapidly, However, cigarette logistics and distribution activities have characteristics such as relatively concentrated distribution requirements, dispersed customer demand points, fluctuating demand, complex distribution area ranges, and operation of distribution vehicles with safety hazards, making tobacco logistics and distribution work very challenging. In the tobacco industry, cigarette distribution is one of the core functions of cigarette logistics distribution centers. Distribution is the work that consumes the most manpower, material resources, and financial resources, and plays a crucial role in obtaining economic benefits, customer recognition, and long-term survival and development for tobacco enterprises. However, with the rise of domestic fuel prices, the cost of cigarette logistics distribution is getting higher and higher. Therefore, in order to effectively reduce the cost of cigarette logistics distribution, on the one hand, the space and load capacity of delivery vehicles should be fully utilized, and it is best to achieve full load as much as possible, so as to maximize the utilization of space and load capacity of vehicles[3]. On the other hand, optimizing delivery routes can save delivery mileage, reduce in transit delivery time, and lower cigarette logistics delivery costs, thereby improving customer service level, enhancing logistics delivery efficiency and quality.

Therefore, this article focuses on exploring the problem of cargo loading and optimization of cigarette logistics distribution paths in cigarette logistics distribution, in order to reduce the cost of cigarette logistics distribution operations, improve the efficiency of cigarette logistics distribution operations, and enhance the competitiveness of China's cigarette industry.

2. Theories related to cigarette logistics and distribution

2.1 Basic concepts of logistics distribution

Generally speaking, logistics distribution refers to the logistics activity of picking, processing, packaging, dividing, and assembling goods within an economically reasonable area according to customer requirements, and delivering the goods to the designated location on time. In logistics activities, distribution is a special form of existence, which is not only a combination of commercial flow and logistics, but also covers commercial flow and logistics activities. At the same time, there is a closed and separable connection with capital flow and information flow. Moreover, distribution also includes various functional elements in logistics activities, mainly including stocking, storage, sorting and distribution, distribution transportation, delivery services, and circulation processing. Therefore, Delivery is actually a microcosm of a fully functional logistics activity in a large logistics environment[4].

2.2 Cigarette logistics and distribution operation process and characteristics

(1) Connotation of Cigarette Logistics and Distribution

The tobacco industry standards define and explain tobacco logistics. In a broad sense, tobacco logistics refers to all additional proliferation activities in the physical movement and circulation process of tobacco and its products, as well as the use of raw materials from production, procurement, storage, transportation, processing to sales and services. From a narrow perspective, tobacco logistics refers to the flow of tobacco products and related materials between industrial enterprises, commercial enterprises, and each other in the tobacco industry based on different social functional divisions. The tobacco industry standard does not provide a relevant definition for cigarette logistics, but as a finished product of tobacco production, cigarette logistics activities can be seen as a branch structure of tobacco logistics activities[5]. Compared with logistics operations in other industries, cigarette logistics itself has the characteristics of "multiple and scattered customer points, small and frequent order volume". Here, the article defines cigarette logistics distribution as the logistics activity in which the cigarette logistics distribution center places orders from cigarette manufacturers based on the actual order requirements of customers at the selling point. The distribution center implements brand classification, picking, processing and packaging, and "assembly and loading vehicles" on cigarettes as needed, and delivers the goods to the cigarette selling point on time and on time

(2) Cigarette logistics and distribution operation process and characteristics

Since the founding of the People's Republic of China, the tobacco industry has gone through a process from commercial unified purchase and distribution to tobacco monopoly circulation. The cigarette logistics system has gradually improved, transitioning from the "self built logistics network and self delivery" model to the "urban-rural integration, centralized distribution" logistics model. Cigarette distribution involves many logistics activities, and its operating system is large and complex. Based on the current operating status of domestic cigarette logistics distribution centers, combined with the main business processes of distribution in the current logistics environment, the logistics distribution business processes of cigarettes are sorted and classified. The overall logistics operation process of cigarette

distribution centers can be roughly summarized as follows: cigarette receiving, cigarette storage, cigarette sorting, cigarette outbound, and cigarette delivery to customers[6]. The operation process of cigarette logistics distribution center distribution is shown in Figure 1.

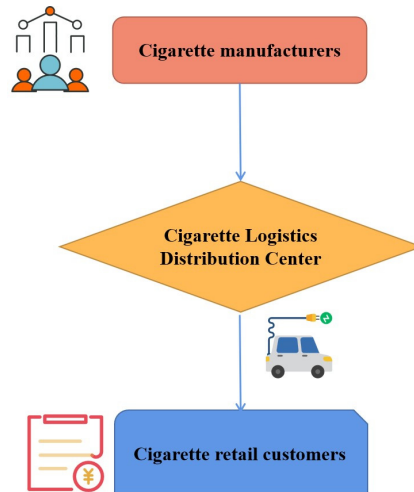


Figure 1. Operation flowchart of cigarette logistics distribution center

2.3 Optimization modeling analysis of cigarette delivery path

(1) Description of delivery vehicle path

The VRP problem of delivery vehicles in logistics distribution centers can be summarized as: starting from the logistics distribution center, determining the driving route of delivery vehicles based on the location of different customer points, using multiple different models of delivery vehicles, and delivering the goods needed by customers to different customer points in a certain order. In the process of delivery, it is necessary to consider the departure order and driving path of the delivery vehicles in order to achieve the goal of the most balanced distribution task volume and the highest distribution efficiency. Based on this, a corresponding mathematical model is established, and the optimal solution of the objective function is obtained according to the established model. Similar to the problem of goods assembly, before modeling, it is necessary to analyze the constituent elements of goods distribution. In addition to the distribution center and customer points in the assembly problem, the constituent elements of the distribution path problem of goods in the distribution center also include the network layout formed by the distribution path, in order to analyze the constraints and objective function[7].

(2) Definition of cigarette delivery vehicle routing problem

According to the optimization objectives of distribution path problems, the number of distribution centers, the loading situation of vehicles used, the distribution task characteristics of customer points, the usage of distribution vehicle models, the types of distribution goods, and the ownership relationship between vehicles and distribution centers, distribution path problems can be classified into different types: according to the number of distribution path

optimization objectives, there are single objective optimization and multi-objective optimization; According to the number of distribution centers, there is a distinction between a single parking lot and multiple parking lots; According to the loading situation of the vehicle used, there is a distinction between full load and non full load; According to the distribution task characteristics of customer points, there are three types: pure delivery, pure pickup, and integrated delivery and pickup; According to the usage of delivery vehicles, there are two types of delivery path problems: single vehicle delivery path problem and multi vehicle delivery path problem; According to the type of goods to be delivered, there are two types of delivery path problems: single variety goods and multi variety goods; According to the ownership relationship between vehicles and distribution centers, there are two types of distribution path problems: open vehicles and closed vehicles.

3 Effective measures for the planning and design of cigarette logistics center

3.1 Construction planning optimization design

During the construction of logistics centers, the process flow design determines the future operating costs, and the layout planning determines the future distribution radiation range. From the source, the design and manufacturing of equipment are related to the effectiveness of the usage stage and the realization of economic benefits. When planning a cigarette logistics center, we should adhere to the principle of optimization, and overall grasp the principles of smooth logistics, energy conservation, pedestrian flow, and non overlapping logistics. When selecting the factory site in the center, it is necessary to meet both transportation needs and safety standards, and the hygiene conditions should meet the requirements of the cigarette logistics center. When selecting roads, it is advisable to choose dual lanes to meet the turning requirements of large vehicles. When designing the layout, it is necessary to fully consider the local climate conditions to ensure the orientation of the building and the requirements of natural ventilation. When planning a cigarette logistics center, it is necessary to scientifically and reasonably arrange buildings and related infrastructure in conjunction with various aspects, design elevations, and minimize the amount of work and investment costs[8].

3.2 Realizing functional zoning through planar layout

Due to the large number of areas involved in the cigarette logistics center, it is necessary to allocate the functions of each area reasonably, including both logistics operation areas and reasonable parking lots. Only by ensuring the rationality of the layout can the design of the cigarette logistics center be more reasonable and meet a series of needs such as warehousing, sorting, packaging, and distribution. For example, when allocating logistics operation areas, narrow and elongated shapes should be chosen as much as possible, and the overall area of logistics operation areas should be designed based on the area requirements of storage and temporary storage areas. You can choose a U-shaped power line structure. For above ground parking lots, analysis should be conducted based on the characteristics and specific circumstances of the plot, which not only meets the requirements of different types of vehicles passing through the park, but also sets up different parking spaces separately. In order to

effectively manage logistics vehicles, underground parking lots can be designed as needed, which can meet parking requirements and fully utilize the land in the cigarette logistics center.

3.3 Can add and implement joint workshops

When designing a joint workshop, it is necessary to establish an overall plan that can combine the logistics service objects and different operations for spatial and functional division. It can be divided into different functional blocks such as storage and sorting area, storage area, sorting area, and auxiliary area. Each block is independent and interconnected to ensure the continuity of logistics and information flow, forming an organic whole. For example, the temporary storage area for storage can meet the functions of unloading and organizing the storage of cigarettes; The storage area is mainly used for storing cigarettes, ensuring fast turnover and improving operational efficiency. Therefore, there is no need for sorting operations after entering the storage area; The temporary storage area for shipment is mainly after sealing off the packaging. In order to comprehensively improve the efficiency of loading and unloading and avoid damage to cigarettes, it is advisable to use cargo cage trucks for consolidation as much as possible. In cloudy and rainy weather, a cantilevered canopy should be set up to avoid affecting the items.

3.4 Optimizing Information Technology Means

As an advanced organizational method and management technology, cigarette logistics centers are considered an important source of profit for enterprises in addition to reducing material consumption and improving labor productivity. They play an important role in the national economy and social development. With the continuous emergence of modern information and network communication technology, electromechanical integration technology and other high-tech and equipment, the continuous improvement of cigarette sales network and the continuous improvement of retail customer service quality, cigarette logistics has undergone a qualitative change from inside out and entered a new stage of use. On the one hand, achieving intelligent full process. Implement intelligent solutions in the stages of receiving and storing goods, sorting and packaging, and stocking up in the logistics center. Optimize the picking system, handling system, sorting system, and access system with an automated full process solution, and also optimize the operation pain points and requirements to quickly improve operation efficiency and save costs. Especially the application of logistics management information systems can achieve a human-machine cooperation system composed of professional personnel, modern communication equipment, and computer software and hardware. Using information technology to unify various logistics activities, complete the collection, storage, processing, and output of information, while also confirming, tracking, and effectively controlling goods [9].

4 Analysis of simulation results for 4 cigarette logistics

For the logistics distribution of cigarettes in a province (district) at the prefecture level city, use "first level, second level delivery, and temporary storage at the transfer station". Convert its transportation rate to a transportation rate consistent with the 2E-LRP model, and the distribution cost is shown in Figure 2.

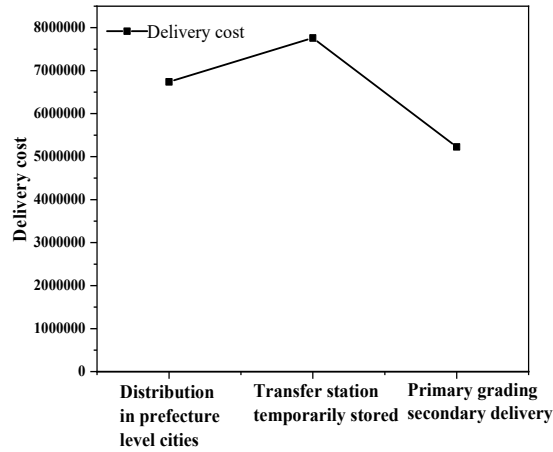


Figure 2. Comparison of delivery costs for different distribution modes in cigarette logistics

As shown in Figure 2, the distribution of resources in prefecture level cities is prone to being idle, and the optimization plan of Yingjie, which includes first level, second level delivery, and temporary storage at transfer stations, incurs higher transportation costs than in prefecture level cities. In the design of regional logistics distribution centers, the goal is to expand the direct delivery range and radiate multiple counties to integrate the entire first and second levels. Comparing different delivery modes, there is a significant change in delivery costs before and after optimization. The design scheme of breaking administrative regions and establishing regional distribution centers has reduced the distribution cost by 1.503 million yuan compared to prefecture level cities and 2.5216 million yuan compared to the "first level, second level delivery, and temporary storage at transfer stations" scheme, thus verifying that the optimized cigarette distribution model has achieved the goal of saving distribution costs. The results indicate that the model design is practical for optimizing the location and vehicle path of cigarette logistics distribution, and the "one level and two level delivery" model is beneficial for the long-term development of cigarette logistics[10].

5 Conclusion

With the continuous development of tobacco industry, the regional unified distribution of goods has been basically realized. By establishing a unified distribution center, it can not only provide logistics support for the development of cigarette industry, but also improve the efficiency of distribution. Therefore, the planning and design of cigarette logistics center is of great significance and role. The cigarette logistics center needs to adopt optimized design schemes in the aspects of cigarette logistics system construction and implementation, cigarette storage management, cigarette sorting and distribution management, cigarette production and operation decision-making system management, payment recovery, logistics vehicle management, logistics cost control and expense management, logistics team construction, logistics security, etc. There are many functional divisions in the cigarette logistics center.

Through reasonable optimized design and scientific long-term planning, the efficiency of logistics transportation can be comprehensively improved, the construction and operation costs can be saved, and irreparable economic losses can be avoided.

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