

Optimization Based on the Current Situation of Cold Chain Logistics of Fresh Food: Case Study from FRESHIPPO

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Abstract. Fresh food is a vital food source for humans daily, with rigid consumption demands. With the development of cold chain logistics, people's demand for fresh food keeps growing. Optimizing cold chain logistics is very significant to meet the growing needs of people for a better life. To take FRESHIPPO as an example, it perfectly satisfies the customers' needs for convenience. In this paper, we analyzed the technologies, industry supervision, facilities construction, talent cultivation, and the current situation of cold chain logistics in FRESHIPPO and China. Also, we tried to find out the deficiencies and the causes and then put forward relative optimized measures and suggestions to offer guidance and advice for the development and the weaknesses of the cold chain logistics of FRESHIPPO.

Keywords: Cold Chain Logistics; FRESHIPPO; Fresh Food; Optimizing.

1. Introduction

In the fresh food industry, a complete supply chain decides the livelihood of the whole industry, and cold chain logistics plays a vital role in this supply chain. Under the background of COVID-19, people's need to deliver cold chains for fresh food keeps increasing as the guarantee of new food storage and transportation, complex chain logistics enterprises with technological advantages can often take the lead in the market. Taking FRESHIPPO as an example, its sophisticated supply chain system ensures the reliability of its cold chain logistics, thus keeping the high freshness of its fresh food from delivery to consumers. Its high competitiveness in the fresh food e-commerce market makes it a benchmark enterprise in new retailing. With the influence of COVID-19, cold chain logistics has become a trend in the present era. The rapid rise of the fresh food market has become an important driving force in the sustainable development of the cold chain supply chain.

However, more problems need to be solved in the fresh food market with the increase in the market scale, including technology, supply chain management, talent training, energy conservation, and environmental protection, improvement in the development of cold chain circulation, the guarantee of people's food safety, etc. The requirements for temperature, humidity, and timeliness of each session of the cold chain supply chain are very high because of fresh food's perishable and perishable nature. Additionally, the construction of China's complex chain logistics industry began in the 1960s; it developed late and is still in the developing stage compared to developed countries. The new era is significant to the optimization design of the supply chain of the cold chain. Our team aimed to review previous excellent cases, such as FRESHIPPO, to propose optimizing suggestions for the shortcomings in the past and to guarantee the sustainable and healthy development of fresh food in the future. We also hoped that new food enterprises could embrace new development opportunities.

2. Theoretical background

If we could not reduce the loss rate, it would become an essential factor that hinders the sustainable development of cold chain logistics [1]. Many scholars have concluded that there are many problems

in the cold chain logistics in China: the underdeveloped technology[2], the industry in chaos [3], the inadequate facilities[4], and the lack of talent. However, the logistics industry in China lacks high-level professional skills, which is challenging to ensure the planning and optimization of critical sessions in the future [5].

2.1 Technology Update

Research carried out by Montanari, and other scholars indicated that during the development of cold chain logistics, management and technology must be combined to monitor temperature and time better; these two factors are vital factors of food spoilage in cold chain logistics [6]. Research carried out by Commère also illustrated that updating technology for cold chain logistics, facilities, equipment, and management modes is the key to ensuring food hygiene [7].

However, cold chain technology is relatively undeveloped, and updates are urgently needed. For instance, it establishes an information system to set up a product archive database by collecting complete and real-time information about every product in the cold chain. It is convenient for consumers to check information and improves the management efficiency of enterprises. A sound cold chain logistics information system can provide accurate information in the market. Implementing complete temperature control throughout the cold chain is also beneficial. Moreover, it can also achieve real-time monitoring of refrigerated transport vehicles via GPS. Logistics loss can be minimized to ensure food safety by real-time sharing of information from upstream enterprises to downstream enterprises.

2.2 Industry Supervision

So far, national industrial industry standards are for reference only; many enterprises prefer to carry out their own standards instead of the federal and industrial standards. At the same time, the supervision of the cold chain delivery is still in the blank stage so far and lacks control and tracking of the hard chain delivery session.

Jiang(2019) carried out a risk analysis on the sessions involved in the fresh food supply chain of e-commerce, including processing, storage, transportation, and delivery[8]. Wang pointed out the risk problems that emerged in the production, collection, and delivery of fresh food under the mode of the supply chain of e-commerce. And he put forward optimizing strategies regarding the new food supply chain of e-commerce with big data and cloud technology[9].

2.3 Construction of Facilities

The construction of cold chain infrastructure would not change in essence within a short time. This is a nationwide and all-around strategic problem. To improve cold chain transportation facilities for production and marketing, to support relevant local departments to expand service function of the cold chain logistics, to offer operation sites to cold chain facilities and equipment; to promote the professional development of cold chain transportation tools; to strengthen the technical management of challenging chain transport vehicles, to promote and use new energy hard chain transport vehicles, to strengthen to efforts in tackling technical issues; to promote the standardized development of complex chain transport units, to encourage enterprises to develop and apply unit packages that are suitable for agricultural products such as fruits and vegetables, to reduce transport losses; to promote and use intelligent temperature control facilities and equipment, to encourage enterprises to improve the temperature monitoring management information system of cold chain transportation, so as to realize real-time monitoring during entire cold chain transportation process and improve the intelligent temperature control management level during the whole of cold chain transportation process.

2.4 Talent Cultivation

Inter-disciplinary talents, mastering much professional knowledge such as refrigeration, heat preservation, food, logistics, supply chain, and so forth, are needed in the cold chain industry. Qiu

Fusheng and Song Haiping(2022) supposed that developing current enterprises' supply chain requires high-end professionals to integrate the supply chain system sincerely with the Internet, big data, and artificial intelligence [10]. However, most cold chain logistics programs are set in higher vocational colleges, focusing on traditional teaching modes and unclear orientation. What's more, they thought there were still deficiencies in the practical work of continuing education, which may cause some excellent logistics talents to be out of touch with the market in the future and lack cooperation with top international universities[11]. With a large extension, we found a lack of many supply chain management talents in the whole supply chain. We need more high-quality cold chain logistics talents to play an active role in the logistics industry to compensate for the compensation age of logistics talents in China.

3. The Current Situation of Cold Chain Logistics

3.1 The Current Situation of Cold Chain Logistics in FRESHIPPO

Inadequate delivery capacity: "to deliver goods in half-hour within 3 kilometers" such efficient delivery service is one of the characteristics of the online delivery of FRESHIPPO; it established certain advantages in the initial operation growth period. However, for today's increasingly competitive new retail industry, this delivery method has gradually become a weakness of FRESHIPPO. Consumers are more willing to stay at home because of the shortage of stores and the poor offline experience in some stores.

Difficulties in selecting stores and expensive costs: based on the user information of Alibaba and the demand data of consumers for fresh products within the 3km radiation range, FRESHIPPO considers the location of its stores from all aspects. It is limited by its value proposition and the selection of people near the stores FRESHIPPO; FRESHIPPO is mainly located in middle and high-end residential areas or shopping malls in first-tier and second-tier cities. The rent of these regional stores is relatively expensive, making it very difficult to achieve overall planning. Although the competitive barriers of heavy assets and high costs are challenging to be replicated by other competitors and these barriers also reduce competitors, certain risks still exist.

At the same time, FRESHIPPO also faces the everyday problems of domestic cold chain logistics:

The fresh food market is hard to sink. So far, the customers of new food platforms in first and second-tier cities are nearly saturated, and there is substantial development potential in third-tier and fourth-tier cities. There are strict requirements for circulation sessions of fresh food products due to the low degree of standardization of logistics facilities in the sinking market, the relatively less scattered target groups, the long transportation time of fresh products and the significant loss, the integration between stores and warehouses, and the mode of preposition warehouse is hard to develop in the markets in lower-tier cities.

The specialization of terminal distribution is too low: the standardization and the freshness of fresh food in the delivery session of the "last kilometer" affect the sense of user experience of new food e-commerce. The integration between stores and warehouses and the mode of preposition warehouse mainly belong to self-operated delivery teams. There are problems like low familiarity with road conditions and poor service awareness among delivery personnel. It is easy to cause delivery delays, reduction in product freshness, a horrible shopping experience for consumers, and increased complaints [13].

3.2 The Current Situation of Cold Chain Logistics in China

Overall, the cold chain logistics system in China shows an upward trend.

Economically speaking, the changes in agricultural structure, the expansion in the scale of cultivated land, the vigorous development of the economy, and the increase in the number of agricultural cooperatives have brought about the scale production, industrialization, and professionalization of agriculture, the resulting increasing agricultural output also lays a solid foundation for the increase in the demand for the cold chain logistics industry.

Socially speaking, the demand for the storage and transportation of fresh food and other products has increased due to the impact of COVID-19. The cold chain industry has witnessed dramatic growth, especially in the cold storage market. For example, cold storage holding increased to 496.7 billion tons in 2020, with a compound growth rate of 11.75% compared to 2016; there were 226,000.00 refrigerated vehicles in 2020, with an increase of 1.6% when compared with that 2019.

Technically speaking, as cold chain logistics is an introductory session between fresh food e-commerce and a range of products, the requirements for the scientific and technological content of the cold chain become higher and higher, which promotes the development of complex chain logistics technology. Especially in the era of informatization and the internet of everything, technologies such as the Internet of Things, intelligent temperature control, blockchain, and so forth would be further invested in cold chain logistics. It is foreseeable that there will be more development opportunities in Cold chain logistics in China.

In China, although cold chain logistics have developed rapidly in recent years, there are still many problems to be optimized:

Inadequate supporting facilities for cold chain logistics and the employee system: so far, the usage rate of cold chains in China is less than 20%. The number of cold storage is low, and the capacity of cold storage per person is only 0.05 m³, with the uneven regional distribution. For example, although the central and western regions undertake 70% of the wholesale trading functions of agricultural products, they still lack refrigeration facilities. There are inadequate professional refrigerated trucks; refrigerated trucks only account for 0.3% of the goods vehicles in China, leading to the incapability of handling large cold chain orders. At the same time, the informationization level of China's cold chain logistics is low. The upstream and downstream of the supply chain cannot obtain immediate information and relevant instructions, such as temperature monitoring and management. In this case, some drivers would miss the best delivery period due to non-standard operation during driving, such as excessive long-time stay.

The quality of employees should be improved: during the delivery period of goods, many sessions are involved, including warehouse staff, drivers who drive refrigerated transport vehicles, and the team responsible for signing for goods. Many problems emerge during these sessions due to the lack of systematic training and a systematic supervision system[11]. And these problems have resulted in a decline in the quality of products when transported, as well as in colossal waste and economic losses. For example, in China, there are approximately 12 million tons of fruits and 0.13 billion tons of vegetables being wasted yearly, with a total value loss of about 10 billion dollars.

Conflicts between supply and demand for cold chain logistics: the market has a high demand for cold chain logistics, but professional and standardized third-party cold chain logistics companies are insufficient. Although many logistics enterprises participate in the cold chain industry, their business share is meager, and their specialization level is not that high. The investment cost of cold chain logistics is high, and the return is relatively slow, which generally reduces the scale and speed of development of cold chain logistics. At the same time, though specific e-commerce chooses to set up their systems, they still face various questions like small scale and low specialization level, and so forth.

High cost in relevant cold chain technology: the downstream cost of low-cost goods is much higher than the upstream production cost, and many manufacturers are unwilling to choose high-quality transportation intermediary businesses. Although some manufacturers of agricultural products have high requirements for cold chain logistics, considering that suppliers in the circulation session have a dominant position of supply exceeding demand for a long time, some suppliers would therefore carry out high price exploitation to reduce profits of producers and to further discourage the enthusiasm of manufacturers. Therefore, manufacturers give up choosing high-quality cold chain logistics enterprises, leading to further deterioration of industry standards [12].

4. Causes analysis

4.1 Supporting Facilities and Supporting Technologies

First, quality and sales volumes would be severely affected because fresh food could spoil and rot during the long-term process of transportation and storage. Therefore, related facilities and equipment for fresh food are of great importance. To be more specific, from a fundamental angle, cold chain logistics needs high-quality refrigerated warehouses and favorable refrigerated transport vehicles. It is very demanding for the refrigerated warehouse and advantageous refrigerated transport vehicles as the putrescibility of fresh food. Certain seafood products also require supporting temporary aquaculture centers. It is necessary to ensure that the relevant management system of refrigerated storage is standardized, the storage and handling equipment are advanced and efficient, the refrigerated transport vehicles are well sealed, the thermal insulation effect is good, and the temperature control is stable. To meet the needs of the current market, FRESHIPPO also expanded and upgraded its relevant fundamental supporting facilities, such as establishing more than 33 multi-temperature warehouses and 4four temporary aquaculture centers.

Apart from these essential elements, information equipment and technology are also very important based on the current market and technological environment. To guarantee the standardization and high efficiency of each session in the supply chain and to prevent the occurrence of non-standard events in the supply chain, which will affect the sales volumes, real-time supervision and management are needed with the application of relevant information technology. So far, many cold chain logistics enterprises have made many attempts; for example, Transportation Management System (TMS) could supervise refrigerated trucks during the entire process to ensure the continuity of the cold chain[17].

4.2 Management, Quality of Technical Personnel, and Relevant Staff

First, to ensure the integrity and perfection of the entire supply chain system advance, high efficiency, and practicability, the supply chain needs relevant management talents; at the same time, to ensure the industrial upgrading of the whole system and to establish a perfect real-time supervision cold chain logistics system, technical mastery and information talents related to supply chain are of great importance. To compensate for the current industry's lack of high-quality skills, FRESHIPPO cooperates with domestic colleges to provide college students with internships and actively offers fresh graduates from supply chain-related programs and university jobs.

Second, the staff in each supply chain session determines the quality of cold chain logistics as a complete system and a series of joint equipment needs workers to implement. Therefore, training relevant staff in hard chain logistics sessions, such as each cold storage and refrigerated transport truck, is essential. The team must establish standardized, efficient, and professional working awareness. However, apart from utilizing traditional human resources, the relevant automated intelligent transportation facilities can also replace manual work to a certain extent, making it more sophisticated regarding work specifications. In this aspect, FRESHIPPO strictly controls the sessions from warehousing and transportation to retailing and actively promotes the intellectualization of vehicles in the warehouse.

4.3 Cold Chain Logistics System

A complete cold chain logistics system determines the company's ultimate revenue, development prospects, and anti-risk capability.

From the production end to the consumption end, the problems of fresh food, such as cost, consumption, and price increase, cause instability in the new food industry, which brings high risks; at the same time, due to the immature development of the cold chain, the current cold chain market in China is in chaos, and the standards vary from enterprise to enterprise. In this case, enterprises need to design a system that meets the need of the market environment and the means of their cold chain of their own. Otherwise, reducing product quality, sales volumes, non-promising prospects,

high cost, and low anti-risk capability is straightforward due to the unstandardized and chaotic system. Even though FRESHIPPO has established its independent cold chain logistics system, it still faces many problems, such as high cost[18].

5. Optimization and Suggestions

5.1 The Input on Enhancing Delivery Technologies

Currently, unmanned supermarkets and unmanned driving technology and management have entered the market, especially under the normalization of COVID-19. The policies regarding unmanned delivery mode modes are advancing. The combination of 5G technology, uncrewed aerial vehicles, and uncrewed vehicles could improve operational efficiency significantly. Cold chain delivery is the most crucial section in FRESHIPPO, especially during peak times. The problem of excessive orders and traffic jams would not ensure that products could be delivered to consumers within the scheduled time. Also, the occurrence of product safety problems during delivery could have an impact on quality. The combination of 5G technology and unmanned delivery can significantly improve delivery efficiency and reduce the cost of the delivery session[19].

5.2 The Cultivation of Special Talents for Cold Chain Logistics

The logistics programs of public undergraduate universities and vocational colleges need to set up relevant cold chain logistics courses and confirm their features according to their actual situation, concentration, and conditions to cultivate distinctive cold chain logistics talents. Also, they need to set up multi-level courses and training projects between colleges and enterprises, introduce advanced international courses, launch international projects of Sino-foreign cooperation, and send students to absorb advanced cold chain logistics courses in foreign countries. At the same time, colleges should strengthen the construction of teaching staff, improve teachers' expertise and knowledge, innovate teaching modes, combine theory with practice, and improve the quality of classes. FRESHIPPO also needs to recruit professionals, set up retraining courses, and constantly improve employees' awareness and ability of cold chain logistics.

5.3 Constructing and Optimizing the Supervision System of Cold Chain Logistics

As fresh food is necessary for daily life, the workload of appropriate supervision and management departments is enormous, which may lead to potential risks in the whole cold chain logistics. As a result, we need to establish a tracking system for every part from the origin to consumers to ensure consumers' safety. Many food safety issues are exposed to the public. It is reported that living maggots in the seafood and rotten fruits were offered FRESHIPPO. The underlying reason is inadequate supervision, especially during the period of COVID-19. We have to optimize cold chain logistics, inspection, sampling process standardization, and personnel allocation optimization [20]. We must utilize all kinds of technologies, such as computers, big data, and real-time monitoring, to discover the risks and establish a unified information-sharing platform so that consumers can obtain real-time information on cold chain logistics around the clock.

5.4 Optimizing the Development and Application of Cold Chain Facilities

The transportation facilities of cold chain involved in production and sales should be improved, local relevant authorities that aim to expand the functions of logistics and services should be supported, and operation sites for cold chain facilities should be offered, especially those related to "the first kilometer". Fresh food e-commerce, express, and logistic enterprises should be encouraged to strengthen the construction of "the last kilometer", such as the cold chain of preposition warehouses in large cities, including intelligent pack stations for cold chain in communities, commercial buildings, and so forth, so that improve the service level for the convenience of customers.

The professional development of tools for cold chain transportation should be advanced. The technical management for challenging chain vehicles should be enhanced. Complex chain vehicles should be equipped with refrigeration and temperature monitoring facilities that meet the standards and ensure they function correctly. Challenging chain vehicles with multi-temperature layers and new energies should be promoted, the update and upgrade of mechanically refrigerated vehicles in railways should be accelerated, efforts to tackle technology issues would be enhanced, and automated refrigerated vehicles in railways that meet the need for transportation should be researched, developed and manufactured.

6. Conclusion

Taking FRESHIPPO as an example, the current situation of FRESHIPPO's cold chain logistics reflects that the current status of cold chain logistics in China has deficiencies in supporting facilities and technologies, management and quality of technical personnel, quality of relevant staff, and cold chain logistics system. Optimization and suggestions should be put forward concerning the shortage and existing problems of cold chain logistics, for example, strengthening the investment in distribution technology, cultivating featured talents for cold chain logistics, establishing and optimizing the cold chain logistics supervision system, and strengthening the development and application of cold chain facilities. Promoting the construction of cold chain logistics improves customer satisfaction and reduces overall distribution costs. It is of great significance to many enterprises, such as FRESHIPPO. It would also help to promote the construction of cold chain logistics in China.

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