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## The development research on Chinese third-party cold chain logistics

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**WORLD MARITIME UNIVERSITY**

Shanghai, China

**THE DEVELOPMENT RESEARCH ON  
CHINESE THIRD-PARTY COLD CHAIN  
LOGISTICS**

By

**WANG TIANQING**

**China**

A research paper submitted to the World Maritime University in partial  
Fulfilment of the requirements for the award of the degree of

**MASTER OF SCIENCE**

**(INTERNATIONAL TRANSPORTATION AND LOGISTICS)**

2008

## DECLARATION

I certify that all the material in this research paper that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me,

The contents of this research paper reflect my own personal views, and are not necessarily endorsed by the University.

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## **ABSTRACT**

Title of Dissertation: **The Development Research on Chinese Third-Party Cold Chain Logistics**

Degree: **Master of Science in International Transportation and Logistics**

With the improvement of living standards in China, people began to pay more attention to food freshness and the safety of food and medicines. China has a great circulation of fresh food. However, due to the poor level of cold chain, compared to the developed countries, each year huge number of products are wasted. A grey correlation analysis tells the relationship between the CCL and various indicators of national economics, which means that there will be an enormous requirement in the future of CCL.

For the improvement of CCL, the professional third-party CCL provider is a better choice for both parties in the cold chain. But through the market analysis on both demand and supply sides, the existing third-party CCL can not meet the need of demand, not only in hardware, but also in software. So a SWOT analysis based on the current condition is given to show the suggestions of development directions. And some model cases also give leading practices of this industry. Finally, the guidance role of government and the corporation in alliance are emphasized.

**KEYWORDS:** Cold Chain Logistics, Third-Party Logistics, Third-Party Cold Chain Logistics, Market Demand, Grey Correlation Analysis, Supply Analysis, SWOT Analysis.

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## **LIST OF ABBREVIATIONS**

CCL	Cold Chain Logistics
3PL	Third-Party Logistics
SOPs	Standard Operating Procedures
COSCO	China Ocean Shipping (Group)Company
Yu He	Yu He Frozen Express Company
WMS	Management System
TMS	Transport Management System
DPS	Digital Picking System
STTS	Serial Test Tasks System
LIMS	Logistics Information Management System



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# INTRODUCTION

## 1. 1 Background of this Dissertation

With the improvement of living standards in China, people began to pay more attention to food freshness and safety of food and medicines. Therefore, the cold chain has been known by increasing number of people. According to China Food Industry Association data, China has a great circulation of agricultural products, the annual vegetable output reached 300 million tons, fruit more than 60 million tons. However, due to inability to achieve circulation of the cold chain, and the poor level of storage and consumption, each year about 12 million tons of fruits and 130 million tons of vegetables are waste, with a total value of 100 billion dollars. At present about 90% of meat, 80% of aquatic products, a large number of milk and soybean basically not guaranteed in cold-chain distribution system. 80% of circulation and primary processing of fresh food's is above refrigeration temperature. The lag in development of the cold chain affects the development of food industry.

In such conditions, analyse CCL market situation in China, identify gaps and inadequacies, and analysis professional CCL provider ——third-party cold chain logistics by the opportunities and challenges and then put forward measures for improving the third-party cold chain is extremely important to the development of the China's cold chain market.

## **1. 2 Cold Chain and The Third-Party Cold Chain Logistics**

### **1. 2. 1 Cold Chain Logistics**

Cold chain logistics (Cold chain logistics, referred to CCL) refers to a project in which the food or medicine will always be frozen in the cold chain environment provisions including the production, storage, transport, sale, and consumption, in order to ensure the product quality and reduce loss. It is set up with the progress of scientific and technological and the development of refrigeration technology. This process takes frozen technology as the foundation, refrigeration technology as a means. As perishable characteristics of fresh food, products must be kept in the entire operation to maintain the appropriate temperature and rapid turnover. Integrity of the frozen supply chain is an essential element of related products' security.

As CCL need a temperature control for the complete cold chain of the cargo (according to the relevant rules), including the loading and unloading, storage, transport and other operations of cargo at a closed environment, in order to ensure food safety. It closely linked with a complex system of engineering, high-tech, high investment and the advanced management. So the requirements of CCL are relatively high, more corresponding management and investment are needed than ordinary temperature logistics.

### **1. 2. 2 Third-Party Cold Chain Logistics**

Compared to the first shipment and the second consignee, third-party logistics industry (Third-Party Logistics, referred to 3PL) means professional enterprises to

undertake other activities of a logistics business chain. And compared to the industrial and commercial enterprises self-employed logistics, a third-party logistics will bring business advantages, cost advantages and customer service advantages to the service users.

The third-party CCL is a special form of supply chain. Compared to normal 3PL, there are more demands in the temperature requirements and the timeliness for perishable food products and medicines. For the industrial and commercial enterprises, third-party CCL saves a lot of pre-investment and time, enterprises don't need to consider operational and management problems anymore. Outsourcing to the CCL company, can solve problems of the transport linked in constantly temperature. Even if the goods are diversity in species, or in small number of shipments and fragmented, CCL companies can fully integrate them by abundant resources, and use multimodal transport to demonstrate the superiority. From the development of the industry trends and the needs of the market-oriented enterprises, third-party CCL is a wise choices for enterprises who need this service in long-term development.

### **1. 3 Literature Review**

#### **1. 3. 1 Outline of Cold Chain Logistics**

##### **1. 3. 1. 1 The Meaning of the Cold Chain Logistics**

Generally speaking, CCL is the maintenance of specific temperature throughout the demand-supply chain (from harvest to the consumer). While there are also some different illustrations of this term by different parties.

Nick Pacciti from Sterling Solution LLC (2006) mentioned that Cold Chain refers to a subset of the total supply chain involving production, storage and distribution of perishable products that require temperature control in order to keep their characteristics and associated value. Because of the every-changing environment, the cold chain is always at risk. And he also illustrated that “COLD” refers to the need to control temperature in preventing the growth of micro organisms in food while maintaining its wholesomeness as it is processed, shipped, delivered and stored at the stores. “CHAIN” focuses on monitoring the "chain of custody" in which each segment of the processing, storage, transport and delivery functions is linked to the step before and after with proper documentation and records<sup>1</sup>.

And in China it is always described as the process in a necessary low temperature environment from the origin of perishable food after the acquisition or fishing, processing, storage, transportation, distribution and retail. Cold chain is a special supply chain system to ensure the quality and safety of food or other product, reduce loss and prevent pollution ([Baidu Encyclopaedia, 2008](#)).

### **1. 3. 1. 2 The characteristics of Cold Chain Logistics**

Cold chain includes four aspects: frozen, storage, transport, sales. Quality of CCL products depend on the following factors: “3P” theory that the materials (Product), quick-frozen before treatment and quick frozen processing (Processing), packaging (Package) which decided the early quick-frozen product quality. And “3T” principle, namely the Time, Temperature, Tolerance, which determine the final quality of quick-frozen products ([Wang Yunhua, 2006](#)).

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<sup>1</sup> Nick Pacciti (10 Oct, 2006) What is the cold chain? *Managing the Cold Chain*.

So it can be summarized that CCL aims to ensure the quality of perishable products, and increase value on the basis of this original value, which determines that it is different from other logistics systems. CCL have the following characteristics:

(1) Complexity

The quality of frozen items changes with the temperature and time evolved in circulation, and different products must be corresponding in different control temperature and storage time. This has greatly increased the complexity of the CCL.

(2) Coordination

As perishable fresh products are difficult for storage, CCL require a highly efficient operation, the logistics in each session of the process must have coordination, so as to guarantee the stable operation of the entire chain.

(3) High cost

In order to ensure the quality of perishable products, they will always be in the areas under low temperature conditions in circulation. Temperature control equipment must be installed, the use of refrigerated trucks and cold storage is necessary. In order to improve the efficiency of logistics operations and to adopt advanced information systems. These determined that the cost of CCL is higher than other logistics system.

### **1. 3. 2 Discussion on the Third-Party Cold Chain Logistics**

The trend towards outsourcing services is one of the greatest changes in global management today. This movement has been particularly evident in CCL where

including pre-cooling, freezing, storing, delivering, distributing and retailing is increasingly subcontracted to specialists or logistics partners.

Because all the technical transport solution have their limitations even though it can handle high or low ambient temperatures over a long time. It is impossible to breakthrough these limitations. Only specialized service provider can properly set standards, monitor the standard, predict when something may go wrong and control cold chain distribution (Martin Peter, 2004). So professional shippers always qualify each new trade lane that will be implemented by the company. The result is a set of standard operating procedures (SOPs), which describe the trade lane from origin to destination, including all the needed action and responsibilities (Nick Pacciti, 2006). That' why only professional service provider are able to live up to these SOPs throughout their entire network.

So in the cold chain, the 3PL partners have a significant role to play. Only specialised or dedicated service providers, such as forwarders and airlines with defined procedures and trained staff can maintain an intact cold chain (Martin Peter, 2004). There is no doubt that the 3PL can not be substituted in the cold chain operation.

### **1. 3. 3 Scholars' Awareness about Third-Party CCL in China**

#### **1. 3. 3. 1 Foreign Scholars' Awareness about Third-Party CCL in China**

From the points of worldwide scholars, many enterprises would prefer to outsource cold chain operations and focus on their core capabilities instead. However, if the



local forwarder in another country does not understand the instruction written in English, an SOP is worth nothing. So in China, most food companies doing business have little choice but to rely on in-house logistics groups to support cold chain operations (Accenture, 2006). Because of the lack of proper cold chain provider.

In fact, Accenture research confirms that high-performance businesses apply their operating models to sustain competitive advantages over time, including embracing opportunities and outsourcing non-core competencies to service providers for which the work is a core competency. From this point, outsourcing can help companies entering or expanding their presence in China to gain access to important new capabilities without upfront capital investments. This is particularly important when conducting business in new or uncertain markets like China. With outsourcing, a company can quickly ramp up for business to capitalize on opportunities in an emerging market (Accenture, 2006). However, more third-party services providers must become available, with capabilities that include cost-effective, integrated, end-to-end supply chain management before outsourcing happen. That is to say, manufacturers, processors and retailers must do it themselves or rely on the few full-service players that do exist, such as Havi Logistics. So most foreign scholars were not satisfied with the Chinese cold chain suppliers, but they were optimistic with the future in China.

### **1. 3. 3. 2 Chinese scholars' awareness about third-party CCL in China**

Most Chinese scholars analysis the reasons of undeveloped cold chain in China: There are no uniform definition and enough information channel for the cold chain in China at present. Different definitions of the cold chain from their own bodies are defined in the contents of a certain difference (Sun Mingyan, Lan Hongjie, Huang

Fengquan, 2007), which led the cold-chain study to the different intentions. This is because that there is not a uniform standard for the 3PL provider to follow. So some Chinese scholars referred that the information in China's CCL markets is limited in the process without a unified standard. Sales also urgently need necessary logistics information of products and the variety number of sources to make decisions (Xu Qing, 2006). Some scholars also mentioned that CCL business as a 3PL nodes should use their own information system, to linked the up and downstream, and to meet their information needs. But at the present some China's 3PL enterprises do not have high level information system, and the information systems of customers are usually not compatible. In addition, the current logistics enterprises have low degree of automation facilities, many operators still remain in the traditional manual stage, low efficiency, high cost, difficult to meet the specific requirements of the CCL. The logistics enterprises have a weak awareness of information, lack of information technology and talented personnel also be the reasons that hindered the process of third-party logistics (Wang Yunhua, 2006).

From the aspect of Chinese research, the reasons for the undevelopment condition of cold chain are focus on the lack of facilities and information system. But most of them didn't mention the reasons of this lack. The important cooperation relationship have not been mentioned as well.

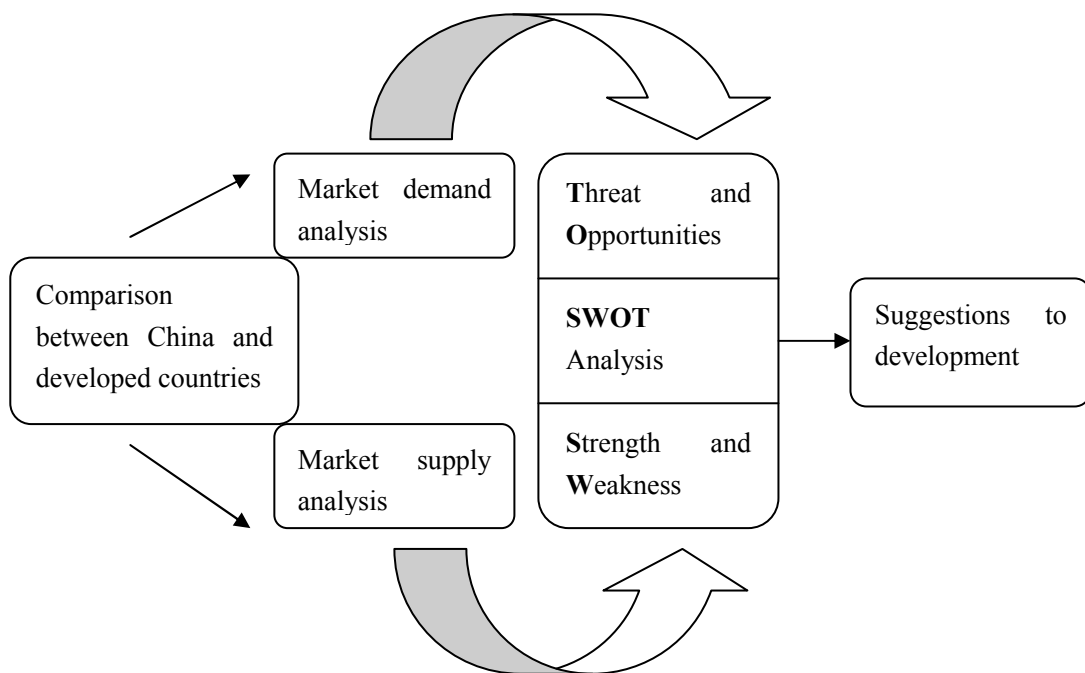
#### **1. 3. 4 Creative Points of this Dissertation**

All the articles on the China CCL mentions that third-party logistics is a necessary solution for the improvement of the whole cold chain, and in China they suggested foreign companies to find an excellent 3PL provider. But most of them didn't

emphasize the relationship between the manufacturer and 3PL. The investment on the cold chain is a huge amount for an entity, so cooperation is very essential in this area. In this article, the construction of relationship will be mentioned, not only between the demand side and supplier but also between the cold chain providers. And in the model case, CCL changed from self-owned logistics have better partnership than others, it will be showed as a leading practice. The application of information management system in the case will be discussed as well.

#### 1. 4 The Framework and Method of this Dissertation

Figure 1.1 The Framework of this Dissertation



The research on the development of 3P-CCL should based on the analysis of market status in quo, the condition compared between China and developed countries

including both sides of the demand and supply, to clear the confliction in the market. Then a SWOT analyses the problems and draws measures, gives suggestions to the future development of Chinese third- party CCL.

In this dissertation, the mathematical model of grey correlation analysis is used to show the relationship between the development of CCL and the growth in various economic areas. And the SWOT analysis in Chapter 5 gives advices on counterstrategies of the third-party CCL industry. In the final chapter, the suggestions are given with model case of Bright Dairy, which is a positive practice to direction of development.

## **CHAPTER 2 THE ANALYSIS OF INTERNATIONAL AND CHINESE COLD CHAIN LOGISTICS CONDITIONS**

### **2. 1 Development Stages and Application Scopes of the CCL**

#### **2. 1. 1 The Origin of the Cold Chain**

Cold chain originated in the 19th century with the invention of refrigeration and the emergence of refrigerators. The emergence of it made all kinds of fresh and frozen food products enter the market and consumer families. To the 1930s of the last century, Food cold chain in Europe and the U.S. initial established. Europe's cold chain system was destroyed in World War II, but also has been reconstructed rapidly post-war. Now, the developed countries in Europe and America have formed a complete food cold chain system.

In the 1950s and 1960s, Japan's rapid economic growth also promoted the flow of trade revolution, in the cold chain it is reflected in the classification, selection, cleaning, processing, packaging, pre-cooling, cold storage, transport and sales of perishable products in the use of cold chain storage technology.

#### **2. 1. 2 Development Stages of Cold Chain**

The development of cold chain can be generally divided into three stages: Vertical, Survival and Innovative.

Table 2.1 Development Stages of Cold Chain

Stages	Vertical,	Survival	Innovative
Period	Pro 1990s	1990-2000	2000 up to now
Processing Time	By Week	Hours or Days	Real time
Decision Plan	Historic	After the Fact	Predictive
System Analysis	Transactional	Thermal Mapping Faster turnaround	Real time analysis

Source: The author collected according to the description of Nick Pacciti (2006).

With the development of information technology, the processing time declined and turn over rates increased obviously. And the trend towards outsourcing services is one of the greatest changes in global management today. This movement has been particularly evident in CCL where pre-cooling, freezing, storing, delivering, distributing and retailing are increasingly subcontracted to specialists or logistics partners. The outsourcing is another reason for the progress of CCL.

### 2. 1. 3 The Application Scope of CCL

Applicable to cold chain including:

- (1) **Primary agricultural products:** vegetables, fruits; meat, poultry, eggs; aquatic products; floral products.
- (2) **Processed foods:** quick-frozen food; poultry, meat, aquatic products and other food packaging; ice cream and dairy products, fast food materials.
- (3) **Special commodities:** medicines.

Different goods have different requirements in the cold chain, which make the

management more complicated. However, for the CCL providers, a large range of customers gives more opportunities to make market segmentation, and choose a suitable strategy for positioning.

## **2. 2 Current Condition and Development Trend of International CCL**

The development and construction of the cold chain in developed countries has entered a relatively stable maturity. They have taken many positive steps in practice of production equipment, production process, the coordination of external environment. The tracing back of the perishable food raw materials and the management of the interface have made great progress too. World Food Logistics Organization has also make some efforts, including the improvement of food and other goods in the preservation, the distribution in the process of refrigeration technology, personnel training, information communication, effective research and development, and will upgrade to the comprehensive logistics services.

For example, the United States take the lead in realizing modernization of the vegetable industry and make better solution of the unbalanced supply of vegetables throughout the year. The issue of the vegetable production in the United States, from planting to harvest site preparation and post-harvest handling, have reached a comprehensive mechanization. Some part of operation has implemented the automation. The United States attaches great importance to post-harvest handling of vegetables in all aspects. General procedures is: harvesting and packaging, pre-cooling at field-election, waxing or sterilization packaging, gradable packaging. In the procedures, vegetables post harvest will always be in physiology demand for low-temperature conditions, which form a “cold chain”, that is, pre-cooling in the

field, cold storage, refrigerated trucks transport, distribution freezer, one-on-demand shopping malls, consumer refrigerator. As appropriate timely treatment, the loss rate in the processing of the United States vegetables is only 1% -2%.

Now, frozen rate of perishable food logistics process in the United Kingdom, the United States, Japan and other developed countries has almost reached 100%, the loss rate of vegetable industry, in the processing of transport links is only 1% -2%. In developed countries, the cold chain storage technology has reached a very advanced level, fresh food kept in the cold chain system, to reduce the depletion of food, while also ensuring the quality of food. The economic and social benefits are enormous .

### **2. 3 The History and Current Condition of Chinese CCL**

China's earliest cold chain appeared in the export business of meat products 1950s. In 1982, China promulgated the *Food Sanitation Law*, which to some extent, promote the development of cold chain. After more than 20 years, with some food processing industry leading as the guide,, many enterprises established the cold chain system to varying degrees with their own products as the core, including the quick-frozen food industry, meat process industry, ice cream and dairy industry and large Fast-food chains industry.

But overall, China basically does not establish a true sense of the cold chain system, the transport and distribution of food still operated directly by production enterprises without outsourcing. Transport enterprises have been gradually carried out refrigerated transport services, but the quality of services also needs to be raised. The



lower reaches of the cold chain link between up and downstream need for re-integration. Information technology has been applied in a certain range, but there should be a great development in the manual processing of automated stage and the future use of information technology to enhance operational efficiency.

In all aspects of the cold chain, food production enterprises are the source of the cold chain, from farm to the wholesale market is the biggest break the cold chain of fruit and vegetable. Fresh fruits and vegetables usually fail to do such pre-cooling treatment, during transport are also usually not in refrigeration. And for the core link of the cold chain - cold storage and distribution facilities, there are also many problems. A lot of cold storage facilities is converted from other uses purpose. The cold-chain management also should be improved, food processing and cold chain storage are not reasonable enough. As the final part of cold chain to consumer, supermarket chain stores are lack of adequate storage areas because of limited storage capacity, so the development of the cold chain distribution centre is quite in need.

#### **2. 4 Comparison between Chinese and International CCL**

Table 2.2 Comparison between Chinese and International CCL

<b>Country</b>	<b>China</b>	<b>Developed countries</b>
<b>Aspects of CCL</b>		
<b>Precooling rate</b>	30% without effective technical and management support	80%~100% in Europe and the U.S
<b>Loss rate after the pick of fruits and vegetables</b>	20%~40%	5%
<b>Refrigeration transport capacity</b>	7 million tons, mainly are large-scale refrigeratory	Total 80 million tons
<b>Rate of refrigeration</b>	Less than 50%, 25% on rail, 15% by truck, 1% by water and 0.1% by air, short for equipment	80%~90%
<b>Refrigerated transport capacity (number of refrigerated trucks)</b>	30 thousand, with annual output: 4 thousand	American: 160 thousand; Japan: 120 thousand; with annual output: 20 thousand
<b>Management of cold chain</b>	Basically does not establish a true sense of the cold chain system, less outsourcing	Advanced and efficient cold chain

Source: Xu Qing (2006) The Countermeasures to the development of third-party logistics cold chain

### Summary:

From the above comparisons, the disparity of CCL between China and the developed countries is obviously in many aspects, including both hardware and software problem. The improvement in China should focus on not only facilities but also the management of the whole chain to come up with the advanced level in the world.

## **CHAPTER 3 THE MARKET DEMAND ANALYSIS ON CHINESE THIRD-PARTY COLD CHAIN LOGISTICS**

### **3. 1 The Demand of Production Enterprises**

#### **3. 1. 1 Meat Production Enterprises**

The profit margin of meat processing is 2.93%, which means relatively good economic returns. According to estimates, meat consumption of China in 2010 will be around 100 million tons<sup>2</sup>, and continue to maintain a steady upward trend, which shows a potential growth in the future. After the market start-up phase, China's meat processing industry is growing stably. This stage is characterized by the rapid growth of consumer groups and continually growing production and sales. Meat products per capita is much lower than developed countries. In the next 10 years, meat processing industry will enter a new period of rapid development.

In addition to the consumer in the cities, where there is still room for meat products expansion, in the rural areas there is a greater potential for demand growth. As China's rural areas speeding up the process of urbanization (see Figure 3.1) and the increasing income level of farmers, food consumption of meat will continue to grow in a longer period of time. By 2010, domestic annual per capita consumption of meat products will reach 10 kg, and meat products account for the proportion of the total output of meat will rise to around 13%, but the current conversion rate of meat only reach 1 / 3 level the developed countries<sup>3</sup>.

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<sup>2</sup> Research Report of China's Meat Processing Industry 2005

<sup>3</sup> Research Report of China's Meat Processing Industry 2005

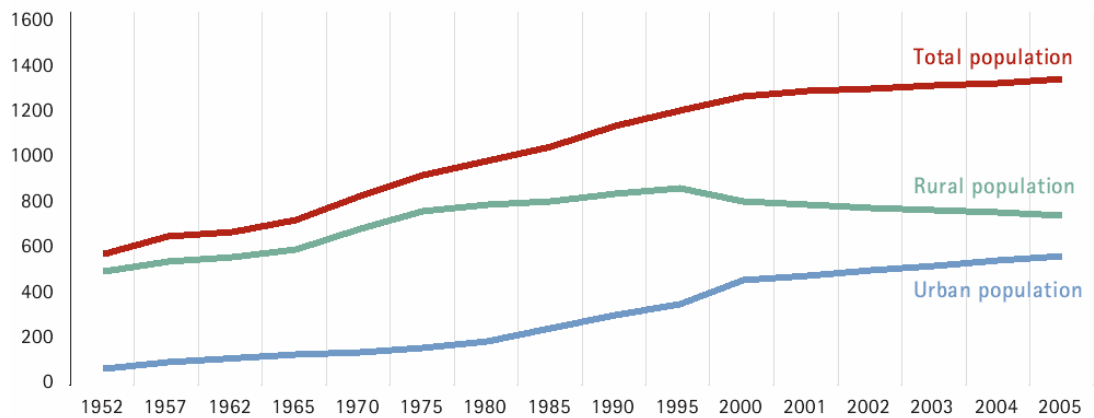


Figure 3.1 Growth in China's urban population (in millions)  
 Source: China Population & Development Research Centre ([www.cpirc.com.org.cn](http://www.cpirc.com.org.cn)).

### 3. 1. 2 Quick-frozen Food Production Enterprises

Frozen food are quickly frozen using the modern quick-frozen technology in  $-25\text{ }^{\circ}\text{C}$  and then under the conditions of low-temperature storage and long-distance transport in  $-18\text{ }^{\circ}\text{C}$  or more. It is a long-term preservation of a new food. Quick-frozen dumplings, quick-frozen glue pudding, steamed bread, and other quick-frozen food are common in the market. Since 1995, the annual increasing rate of China's quick-frozen food production has been 20 %, the annual output is close to 10 million tons<sup>4</sup>. According to incomplete statistics, in recent years, there are near 2000 factories in China which produce various types of quick-frozen food, annual sales are 10 billion Yuan. San quan, Synear and Longfeng occupied the important position of the first group in all quick-frozen food brands, all of them take more than 10% of the market share. All these three with more than 500 million Yuan of annual sales

<sup>4</sup> Su Xiujin (2006). Research on Logistics Planning of food cold chain

become the country's quick-frozen food market leading enterprises. The second group has large categories, but each brand takes very limited market share.

There are very strict requirements in quick-frozen food storage and transportation. They must be guaranteed below the  $-18\text{ }^{\circ}\text{C}$  But at present, a professional, social cold chain distribution system of quick-frozen food, which can continually adapt to changes in the market have not yet formed.

Table 3.1 2002-2005 Part of Quick-frozen food sales condition(million Yuan)

	2002	2003	2004	2005
<b>Total number of sales</b>	231.1	234.3	249.4	340.0

Note: Data is the sum of the frontline cities Beijing, Shanghai, Guangzhou

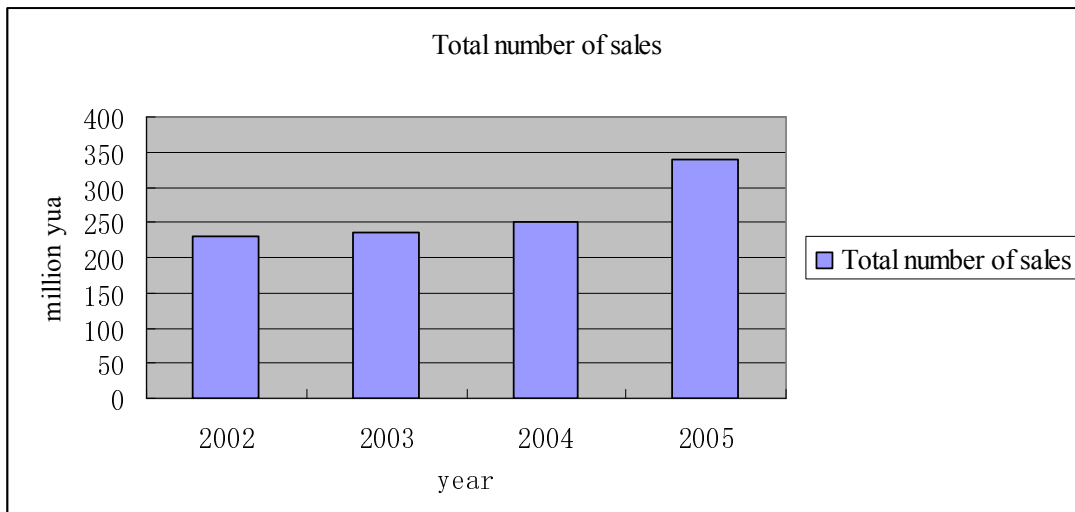


Figure 3.2 Total number of Quick-frozen food sales in three cities

Source: Su Xiujin(2006). Research on Logistics Planning of Food Cold Chain

### 3. 1. 3 Dairy Production Enterprises

Since 1990, China's milk-based dairy production has entered the rapid development period. In 1990-2000, the average growth rate reached 12.1%, ranking first in the world. In 2006, annual production reached 33.025 million tons, per capita consumption reached 25.19 kg each person.<sup>5</sup>

In normal circumstances, fresh milk needed to be shipped to a dairy processing plant, the freshness of goods are demanded in every day distribution. The mistakes in transportation would result in fresh milk degeneration, causing heavy losses. To ensure quality, fresh milk transport have special requirements: In order to prevent temperature of fresh milk increasing in the transport, especially in the summer, general choice is in the morning, evening or night. Carriers are generally dedicated milk tanker. To shorten the transport time, there are always no stops in transportation. Capacities need to be strictly disinfected to avoid contamination during transport. Containers should be full loaded and sealed up, to prevent the warming and spilling out in transport process due to shocks.

In order to ensure quality, professional dairy enterprises mostly hope that using their own transport, logistics outsourcing is not the very high wished. Even outsourcing, only parts of the short-distance transport routes in some regional distribution are chosen, but also high requirements on technology and quality.

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<sup>5</sup> Joint Investigation Report of Bright Dairy(2006), Website:  
<http://www.foodqs.com/news/gnspzs01/20038212066.html>

## **3. 2 The Demand of Commercial Enterprises**

### **3. 2. 1 Catering Industry**

Yum! China Division is the largest restaurant group in China, with more than 1,500 KFC and 200 Pizza Hut outlets. China is the only country where Yum! builds its own distribution centres in major market areas. According to its general manager, “There is no local CCL company that can offer such a large-scale and high-quality service, and our US logistics partner has not been in China yet.” With direct control of the entire cold chain process, Yum! ensure that all necessary innovations are applied. For example, each trucks allows food to be stored at different temperatures in different refrigeration units.<sup>6</sup>

Another well-known global enterprises McDonald's restaurant in the Chinese market continue to use its global logistics partners. McDonald's chose Havi Logistics, who provide a quality service all over the world. In McDonald's CCL, quality is always the greatest weight and in most important considerations. In the spirit of McDonald, attention to the quality before they opened a restaurant is evident. When restaurant siting is complete, the establishment of local production, supply, transportation and a series of network system is priority to ensure the high-quality raw materials supply of restaurants. No matter what kind of products, as long as access to McDonald's procurement and logistics chain, they must go through a series of strict quality checks<sup>7</sup>.

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<sup>6</sup> Jamie M. Bolton (2006) Creating an effective China "cold supply chain" Current status, challenges and implementation considerations *Accenture*

<sup>7</sup> Cold Chain of McDonald's in China(2005),  
Website: <http://publish.it168.com/2005/1012/20051012016001.shtml>

McDonald's requirement to logistics services is more stringent than others. In the food supply, in addition to the basic food transport, McDonald's asks to provide logistics services and other services, such as information processing, inventory control, labelling, production, quality control, and so on, these "extra" costs of services, though relatively high, make McDonald's gain in competitive advantage.

While in transportation, many local enterprises still use common method. In this single-volume delivery mode, not only can not guarantee the quality of the products, but also a direct result of low-priced competition on the logistics market. A logistics manager of Havi Logistics has very deep feelings that such low-priced competition will bring great pressure to China's logistics market .

### 3. 2. 2 Retailing Industry

In China, the most expenditures is still on food.(see Table 3.3& Figure 3.3). So the requirement of fresh market is very common. And in the business of fresh supermarket, logistics and supply chain management is the key factor, because the logistics of the fresh food can ensure timely supply of fresh products in a low price, high-quality operations. Throughout the failure of the fresh chain management business and the poorly operating performance of current companies, it can be seen that apart from low level of scale-economics, poor management of fresh logistics and supply chain are the key factors.

Table 3.3 Chinese annual per capita expenditures

Miscellaneous	Household goods	Health care	Clothing	Housing	Transportation	Education/recreation	Food
3.30%	5.70%	7.40%	9.60%	10.20%	11.70%	14.40%	37.70%



Source: : China Statistical Yearbook (2005)

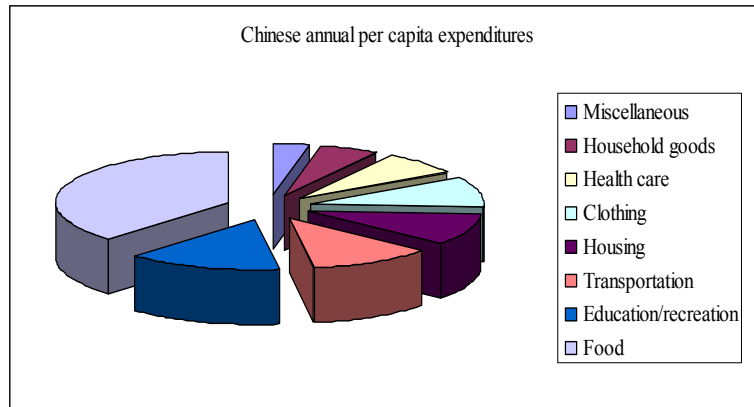


Figure 3.3 Chinese annual per capita expenditures

Source: : China Statistical Yearbook (2005)

Today the share of cold-chain goods is growing in the supermarket, account for more than 20% of food sales. These requirements of temperature of the food is not the same as each other, such as the preservation temperature for fresh vegetables and dairy products is  $0 \sim 7^{\circ}\text{C}$ , meat, aquatic products is  $-2 \sim 2^{\circ}\text{C}$ . In order to maintain their quality and flavour, temperature must be controlled within certain limits in the process of storage and transport in the cold chain. Secondly, because of the cold chain needs of a particular food storage conditions, retailers generally choose to a delivery mode of fewer quantities, multi-species and multi-frequencies. In addition, the supermarket delivery orders changes quickly, and seasonal factors of cold-chain food sales are very obvious. These characteristics determine the CCL companies must make great efforts in the preparation of transport and storage capacity and cost control. Supermarkets do cold chain distribution is a very complicated work.

Information of supermarket distribution often have to transfer many times: every day before off work, the order blank of supermarket should reach the hands of suppliers,

suppliers then pass on their information to various distribution agents, delivery agents get back to suppliers for goods under orders, transport to the supermarket after carpooling. Once the information of distribution on orders inconsistent with the supermarket, it is necessary to make a number of communication between providers and the supermarket.

As the networks and information systems are not sound enough, the accuracy and timeliness of supermarket cold chain distribution are relatively poor, and the promotional activities often have to buy gifts-with, makes the delivery of documentation varieties, quantities, specifications, price and others do not match with the orders, resulting in differences in the information. So that the time of delivery has been delayed. Most supermarkets start receiving fresh goods in 5:00, the drivers who responsible for the cold chain distribution should confirm goods orders first with food manufacturers staff. Or the driver should contact the company's logistics and operational management staff to confirm orders. If not lucky, driver must waiting for the news with fresh goods on his car, and sometimes even take goods back to the cold storage. As a result, a waste of resources, low efficiency, and cold-chain costs increase. So a better third-party CCL is quite in requirement for retailing industry.

### **3. 3 The Prediction of Demand of Chinese cold chain**

#### **3. 3. 1 Grey Correlation Analysis on the Relationship between Cold Chain Demand and Economics.**

##### **3. 3. 1. 2 Brief introduction to Grey Model**

Gray Model is a prediction system with uncertain factors to predict the way. Gray forecast not only contains known information but also contains uncertainty information. And within a certain scope of the changes, grey process predicts based on time.

Gray forecast analyses and generates raw data in a processing system to find changes in the law, through the identification system of factors between different levels of development trends, correlates and generates more systematic data series, and then establishes the corresponding differential equations model, which forecasts the development trend of the situation.

Grey prediction method forecast the future characteristics of a particular moment, or the time used to reach a certain characteristics through a grey structure prediction model that formed by a series of projections numbers, which reflect the characteristics of the observed objects in the same time period.

### **3. 3. 1. 2 Correlation analysis**

Correlation analysis one of the main elements of grey model analysis. In the analysis it adopted the relative changes of system factors in the development, does not need too much data, but able to describe the factors better and determine the relationship between the degree to find the main factors and secondary factors to promote and guide the system quickly and effectively development.

The substance of correlation analysis is the geometry comparison of time-series data. If the two series are coincide in various points with every moment, that is a correlation coefficient, then the relevance of the two series also will be equal to 1. At

the same time, the two comparative sequence can not vertical at any time, so correlation coefficients are greater than 0, the relational degree are greater than 0. Therefore, the relational degree of the two sequences can the be calculated with the average correlation coefficient compare with different periods of the sequence, which reflects the degree of relevance in the whole process.

### (1) Correlation Coefficient

$$\hat{X}^{(0)}(k) = \{\hat{X}^{(0)}(1), \hat{X}^{(0)}(2), \dots, \hat{X}^{(0)}(n)\}$$

$$X^{(0)}(k) = \{X^{(0)}(1), X^{(0)}(2), \dots, X^{(0)}(n)\}$$

correlation coefficient can be defined as:

$$\eta(k) = \frac{\min \min |\hat{X}^{(0)}(k) - X^{(0)}(k)| + \rho \max \max |\hat{X}^{(0)}(k) - X^{(0)}(k)|}{|\hat{X}^{(0)}(k) - X^{(0)}(k)| + \rho \max \max |\hat{X}^{(0)}(k) - X^{(0)}(k)|}$$

$|\hat{X}^{(0)}(k) - X^{(0)}(k)|$  is the absolute error of  $X^{(0)}$  and  $\hat{X}^{(0)}$

$\min \min |\hat{X}^{(0)}(k) - X^{(0)}(k)|$  is the minimal differential of poles

$\max \max |\hat{X}^{(0)}(k) - X^{(0)}(k)|$  is the maximal differential of poles

$\rho$  is known as resolution,  $0 < \rho < 1$ , general admission  $\rho = 0.5$ ;

In the calculation of the correlation coefficient, different units and initial value in different sequences, should be initialized at the first, that is, all the data divided by the first data in the sequence.

### (2) Relational Degree

relational degree between  $X^{(0)}(k)$  and  $\hat{X}^{(0)}(k)$  is

$$r = \frac{1}{n} \sum_{k=1}^n \eta(k)$$

### 3. 3. 1. 3 Grey Correlation calculations on the relationship between cold chain and national economic indicators

As the CCL is a complex concept involving various industries and enterprises, it is difficult to measure with unified quantitative indicators, so in this article an important part of CCL - number of refrigerated trucks, the main tool for refrigerated transport, is selected as representatives, to analyse correlation between various indicators of national economy and the growth of CCL .

Table 3.4 Basic Data of Grey Correlation Calculations

<b>Economic Indicators \ Year</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
<b>Retain number of refrigerated trucks</b>	17997	19173	20268	21753
<b>GDP (100million Yuan)</b>	88254	95727.9	103935.3	116249.6
<b>GDP of Transportation, communication Posts and Telecommunications industries (100million Yuan)</b>	5408.6	5968.3	6420.2	6715.6
<b>GDP of Wholesale, retail trade and catering industries (100million yuan)</b>	7316	7918.8	8476.7	9027.7

Source: China auto industry Yearbook(2004), China Statistical Yearbook (2004)

$$X_1 = (17997, 19173, 20268, 21753)$$

$$X_2 = (88254, 95727.9, 103935.3, 116249.6)$$

$$X_3 = (5408.6, 5968.3, 6420.2, 6715.6)$$

$$X_4 = (7316, 7918.8, 8476.7, 9027.7)$$

(1) Initialization

$$X'_1 = (1, 1.065344, 1.126188, 1.208701)$$

$$X'_2 = (1, 1.084686, 1.177684, 1.317216)$$

$$X'_3 = (1, 1.103483, 1.187035, 1.241652)$$

$$X'_4 = (1, 1.082395, 1.158652, 1.233967)$$

(2) Solve the differential of the sequence

$$\Delta_2 = (0, 0.019342, 0.051496, 0.108515)$$

$$\Delta_3 = (0, 0.038139, 0.060848, 0.032951)$$

$$\Delta_4 = (0, 0.017051, 0.032465, 0.025265)$$

(3) Solve the differential between the two poles

$$M = \max \max \Delta_i(k) = 0.108515$$

$$m = \min \min \Delta_i(k) = 0$$

(4) Calculate the correlation coefficient

$\rho = 0.5, :$

$$\gamma_{1i}(k) = \frac{0.054257}{\Delta_i(k) + 0.054257}, i = 2,3,4$$

$$\gamma_{12}(1)=1 \quad \gamma_{12}(2)=0.737197 \quad \gamma_{12}(3)=0.513054 \quad \gamma_{12}(4)=0.333332$$

$$\gamma_{13}(1)=1 \quad \gamma_{13}(2)=0.587222 \quad \gamma_{13}(3)=0.471371 \quad \gamma_{13}(4)=0.622158$$

$$\gamma_{14}(1)=1 \quad \gamma_{14}(2)=0.760887 \quad \gamma_{14}(3)=0.625646 \quad \gamma_{14}(4)=0.682287$$

(5) Calculate the relational degree

$$\gamma_{12} = \frac{1}{4} \sum_{k=1}^4 \gamma_{12}(k) = 0.645896$$

$$\gamma_{13} = \frac{1}{4} \sum_{k=1}^4 \gamma_{13}(k) = 0.670188$$

$$\gamma_{14} = \frac{1}{4} \sum_{k=1}^4 \gamma_{14}(k) = 0.767205$$

According to experience, when  $\rho = 0.5$ , if the relational degree is higher than 0.6, the degrees is satisfied.

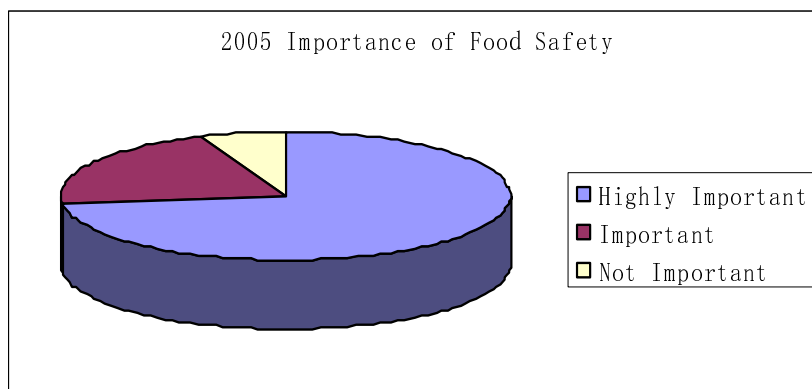
It is visible by the analysis, changes in the number of refrigerated trucks have a greater degree of relevance with gross national product(GDP), as well as economic indicators of catering, retail and transport industries. And it is most closely related with wholesale, retail trade and catering industry in the economic indicators. This fully shows that the CCL is a derivatives demand of the related commercial and production enterprises. With the development of national economic and continuously maturing catering and retail sector, market prospects of CCL will be even larger in the future.

### **3. 3. 2 The Prediction of Demand Growth of Cold Chain**

One-fifth of the world's consumers live in China - more than in all of Europe and North America combined. And with market reforms happening regularly, the buying power and material success of China's 1.3 billion citizens have never been higher. Across the country, people are buying more. The reform and opening up of China

make the economy growing highly for nearly 30 years, creating a large number of affluent middle class. Their average annual income is between 5000-10000 in dollars, with a large number of deposits. Middle class is always defined as a group of people who has a stable income and ability to buy a house or buy a car, and the income can be used in tourism, education, and other consumption activities. Currently, the proportion of the population in this class is not too big in China, but because of China's huge population base, the absolute number is enormous. In 1993 the magazine *Outlook weekly* estimated in China the middle class has 30 million people. Now, China's middle class is now estimated around the number 250-300 million, about 20 to 25 % of the total population. And as expected after 20 years, China's per capita GDP reached 10,000 U.S. dollars, entered the list of middle-income countries, the middle Class ratio of the total population will reach 40 %, the number is around 560 million<sup>8</sup>. The pursuit of good health and longevity is the wish of the people forever. As a population of some richer people than others, the middle class will pay more attention to health care, as well as food safety.

Figure 3.4 Survey on Food Safety 2005



<sup>8</sup> Zhang Jing (2007). The Rise of China's Contemporary Middle Class and its Social Function. *Northwest Population*, 4,(28),116-121



In the year 2005, an inquiry on the importance of food safety shows that 73% of people thought that the food safety is highly important, while 6% thought it is not important

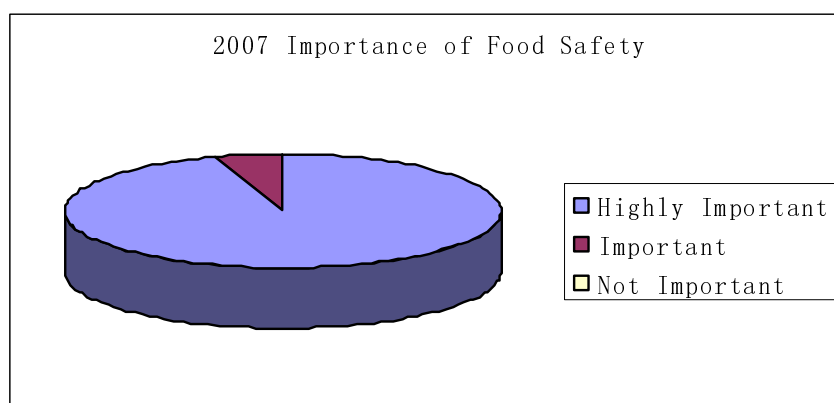


Figure 3.5 Survey on Food Safety 2007

Source: CIES food safety consumer survey, A.T. Kearney analysis

But the inquiry two years later, result changed evidently. No people thought food safety made no sense, however, 95% people confirm that it is highly important.

Economists Professor Chang Xiuze, said an annual growth rate of China's middle class is 1% according to magazine *Outlook weekly* report. He believes that the middle class has formed and expand gradually, will drive the growth in consumer demand and consumption structure upgrading<sup>9</sup>. This trend is an important endogenous factor for the steady growth of domestic demand.

According to the analysis A.T. Kearney, the demand of Chinese third-party CCL will increase tremendous in the following ten years, not only for the poor level of Chinese cold chain current situation, but also for the evident rising tendency of the middle

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<sup>9</sup> Chang Xiuze(2007). Property rights system of Resources, and environmental. *Outlook weekly*, 10

class number. Their prediction is based on Per Middle Class Capita, which will be the key factor of the promotion of Chinese cold chain.

From their estimated statistic, the refrigerated truck will be decuple of the actual number, and the cold storage areas will climb to the new level as well.

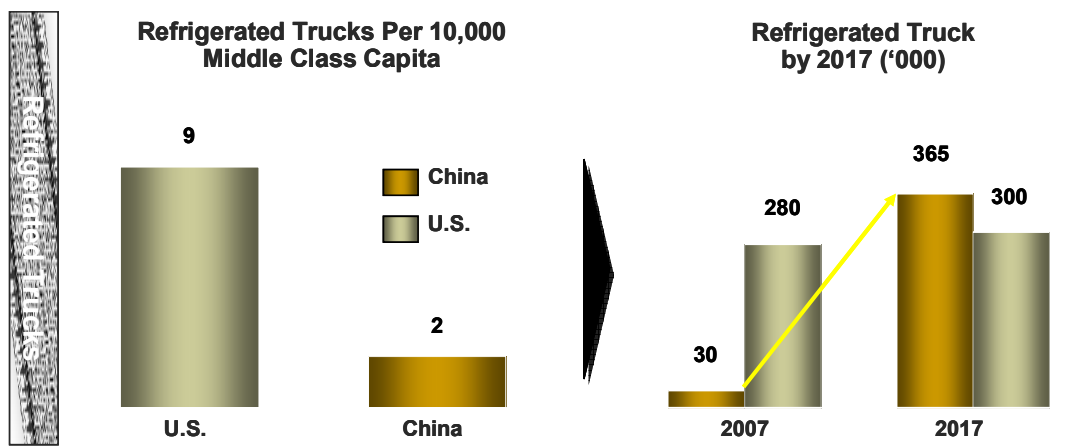


Figure 3.6 Prediction of Refrigerated Trucks Per 10,000 Middle Class Capita and Comparison between China and the U.S.

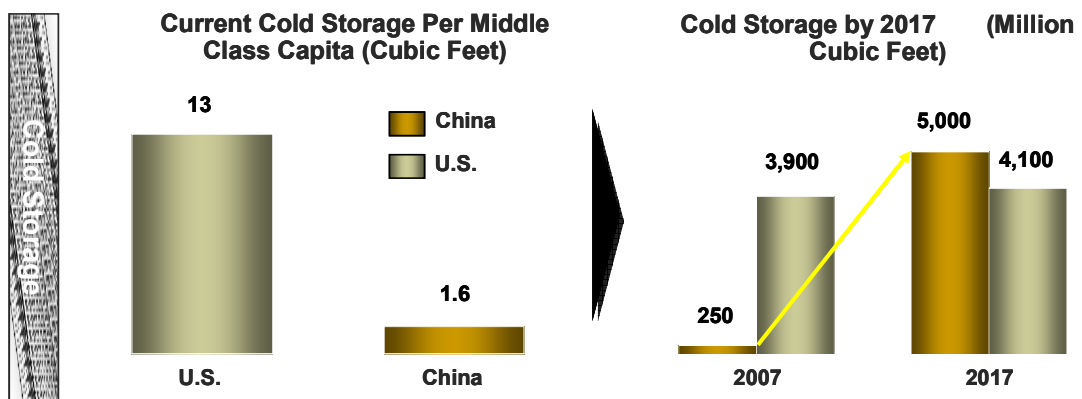


Figure 3.7 Prediction of Cold Storage Per Middle Class Capita and Comparison between China and the U.S.

Source: USDA, China Logistics & Purchasing, China Ministry of Transportation, 2002 Economic Census, USDOT, A.T. Kearney analysis

## **Summary:**

The need for CCL from both production and sale enterprises is rising up with no doubt. It is closely related to the economics indicators, especially to the growth of wholesale, retail trade and catering industry. The CCL will greatly affected the quality of perishable products, the accuracy and timeliness in transport. At the same time a poor CCL will cause high cost of logistics products and the high attrition.

But the majority of domestic enterprises who demand CCL, although has recognized the cold chain for the importance of the transport of food storage, and also ensure that the cold chain of production into the core business, most businesses have not taken the professional third-party logistics, while tend to self-operation, such as Shuanghui Cold Meat and so on. So compared to foreign enterprises, who made good long-term results in the CCL outsourcing, 3PL for cold-chain management is far from universal application in China, which is opportunities for Chinese third-party development of CCL, but also challenges.

## **CHAPTER 4 THE SUPPLY FACTORS ANALYSIS ON CHINESE THIR-PARTY COLD CHAIN LOGISTICS**

### **4. 1 The Main Operator of Third-party CCL**

#### **4. 1. 1 Large State-Owned CCL**

##### **4. 1. 1. 1 Brief introduction of typical large state-owned CCL**

State-owned CCL always have large scale and nationwide network, they were always set up by some policy factors. Here the COSCO Refrigerated Transport Company and Sinotrans Yu He Cold Chain Logistics Limited are chosen as representatives to illustrate the condition of large stated-owned CCL.

##### **(1) COSCO Refrigerated Transport Company**

The COSCO Group, who is famous for ocean shipping and international freight forwarding business, was one of the biggest companies who first set foot in the field of cold-chain. Its underling companies - Refrigerated Transport companies, founded in 1994, spent millions of dollars on high-end configuration of refrigeration unit, refrigeration containers, and other professional equipments. Although the profit once ranked at the top three of the industry, the COSCO Refrigerated Transport Company was not able to stop the rapid decline in business after 2000. Continuing loss of customers, made high-level of COSCO decide to abandon this business. In 2004, COSCO Refrigerated Transport Company closed.

##### **(2) Sinotrans's Acquisition of Shanghai Yu He Frozen Express Company**

Sinotrans took the form of mergers and acquisitions to enter the cold-chain industry. In December 29, 2004, Sinotrans acquired 60% of the shares of Shanghai Yu He Frozen Express Company(Shanghai Yu He Frozen Express Company, referred to Yu He ), which held in Yu He Group Zhan Zhou, Fujian Province. After acquisition, the company name changed to “Sinotrans Yu He Cold Chain Logistics Limited”. With the sources of customers from Yu He, and the solid background of logistics from Sinotrans, the company was forecasted “bullish” by the majority of outside. However, voices from Yu He internal have become more cautious. With a aim of nationwide cold chain business in the country, Sinotrans will have to go out of “greenhouse” to face other difficulties in other cities.

#### **4. 1. 1. 2 Large CCL companies’ competitive advantage**

##### **(1) Have sufficient fund to purchase advanced equipment**

When COSCO CCL set up, large quantities of advanced equipment had been purchased, which was considered the largest investment in cold-chain market at that time. These cold-chain equipment makes the COSCO logistics management maintain a high level of service, even when reselling the cold-chain equipments in 2004 after the company was bankrupt, these devices are still attracted many private cold-chain companies’ competition. A private company boss who bought bulk of the equipments said, “Even have been used for 10 years , these refrigeration units is still high-end in our company”.

##### **(2) Have nationwide networks of transport and agent**

Utilizing their nationwide transport networks and agents to build cold-chain network, is one of the advantages of the large state-owned cold chain enterprises. In China, for a large state-owned enterprises, such as the COSCO, customers almost throughout

the country. Each region has officers familiar with the local situation. It is a great advantage in the network construction of the logistics enterprises.

#### **4. 1. 1. 3 Large CCL companies' competitive disadvantage**

##### **(1) High service prices**

In China, the state-owned logistics have not got profits firstly in this the cold chain area "Price war with rivals, took away a lot of customers." Private enterprises commonly use second-hand equipment and make low-cost and flexible transport mechanism to press the freight much lower. But operating costs in COSCO, and other state-owned enterprises can not drop too much.

##### **(2) Organizational structure is too complex**

In the long process of mergers and acquisitions, Yu He was busy with the affairs caused on stakes, which make margin and operating loss reached 10 million Yuan in the following two years. The central customers, Metro, KFC, and other major clients had turned to other companies. When the company got into normal operations, it can not find new profit growth point. It is said that the continued loss of margin and has led to the high-level changing of company. However, with the strength of Sinotrans in the capital injection, the board chairman of Yu He believed the potential for industry will bring strong demand to company .

#### **4. 1. 2 Private CCL**

Although the cold chain industry in China has developed for many years, but there are not many bigger and stronger companies, and many state-owned enterprises CCL

have encountered numerous difficulties. But a large number of private CCL has developed in the cracks. Private family business - Rongqing Logistics is a very good example.

#### **4. 1. 2. 1 Brief introduction to Rongqing Logistics**

In early 1990s, vegetable delivery business in Cangshan of Shandong province, hastened the birth of many “one family - one car” individual transport companies, Rongqing Logistics is one of them. From driver shift operation to the creation of company, the founder used four years. Buying another car when earned money, and then employed a familiar fellow villager as the driver, has also become a major expansion mode of Rongqing Logistics in the first 10 years.

Take Shandong Province as the logistics base, Shanghai as the centre to cover Nanjing, Wuhan, Guangzhou, and other cities, Rongqing has set up many routes with customer resources and cargo back way. Goods scope of Rongqing Logistics has expanded from normal cargo to higher value-added goods such as IT products. However, by early 2004, Rongqing Logistics encountered a bottleneck inevitably. With possession of nearly 200 cars, and the network covering more than half of China, Rongqing Logistics can not bear the elevation of oil price, tariff. And the cutthroat competition on different routes also made Rongqing struggling to cope with. With less than 5% profit margin, Rongqing Logistics decide to shift to the cold chain transport in a family meeting.

In fact, as early as 1998, Rongqing Logistics began to get involved in the refrigerated transportation business. At that time, Shandong Jinluo Cold Meat Ltd. needs to carry meat product to Beijing, Guangzhou and other places. Rongqing Logistics purchased

a number of shipping containers and linked to the vehicle, used as incubator. Although retired from the ship, the tightness and cabinet structure of this container meet the requirements. And this low price containers on vehicles, is their winning key. So far, Rongqing Logistics already has more than 160 refrigerated trucks, services more than 10 large enterprises including Mengniu Dairy, Yili Dairy, and so on. This performance stands out in the CCL market<sup>10</sup>.

#### **4. 1. 2. 2 Private CCL competitive advantages**

##### **(1) Price advantage**

Because of the scarce supply of frozen cargo, after long-distance transportation service, the majority of refrigerated trucks only have to return empty or visit unfamiliar allocation stations frequently. But Rongqing's low cost of refrigerated trucks makes it less scruple. In Rongqing Logistics, the refrigerated trucks are used as normal trucks at least half time. Cost of refrigerated trucks changed from shipping container is less than 700,000 Yuan, saving about 30% money in vehicles purchase. Some one figured out that the configuration of Rongqing refrigerated trucks will affect the frozen quality of some special food. But in fact, because of low profits, Rongqing Logistics has abnegated such a business. After the business season of summer, the professional cold-chain vehicles of other company's have to stay in the garage. Refrigerated trucks of Rongqing Logistics are still in use on different routes. When capital management, network coverage reach a certain level, Rongqing Logistics began to play the role of prices killer, with a broader supply and lower prices to cope with the psychological value of the contract.

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<sup>10</sup> Zheng Minhao(2008). The Typical Model of Chinese Private Cold Chain Logistics – Rongqing Logistics. *Logistics Management*, 3



## (2) The new self-made containers

When customers need stability and sustaining temperature protection, the poor sealed defect of maritime boxes and the weight disadvantages enlarged in transport again. Drivers complained that these old boxes not only exhausted oil, but also easily broke the security line of the temperature if not pay highly attention to. Afraid of the compensation, Rongqing Logistics determined to change the box. But for 30 % more of the purchase cost, it is always a difficult decision. In a family conference, Rongqing Logistics decided to make their own boxes for use. With years of operating experience on the car adaptations and shipping containers modification, Rongqing people really came up with a new method of making boxes. This organic-based containers of the foam insulation simple system, has been pushed into the Rongqing Logistics pipeline. A box 2,000 Yuan cheaper than out purchase one, also meet the cooling requirement of the high-end customers. Now, half of the vehicles in Rongqing Logistics have used new containers. And the box has not only for self use. For their investment on the boxes manufacture plant, they hoped that products can be large-scale selling in future.

## **4. 1. 2. 3 Private CCL competitive disadvantages**

### (1) Lower level of services

In low-priced competition, some CCL enterprises close refrigerating units in the middle of transportation, some used camouflage as refrigerated trucks, while others change trucks half-way to save the cost. In warehousing, equipment transport, and other areas, there are also some non-standard operations. One of the personnel in state-owned enterprise said that refitted refrigerated trucks used by small private CCL will affect the quality of frozen. While private cold chain operator said that only foreign consumers will see whether the meat is not completely thawed, the Chinese

people will not be so choosy. Rongqing Logistics believed that consumers decide the company's standards, and what their need to do is simply “just right”. This strategy is very useful in market positioning, but for the development in long period, it is not a wise choice.

(2) Lack of support from major clients

Lingxian and Havi Logistics are relying on the distribution of Bright Dairy and McDonald's to develop a third party services. If there are no major customers, they are more difficult to develop. The improvement of logistics enterprise itself, and how can they do a good job in services are very important. After all, third-party CCL is a young industry. 3PL itself should cut costs and expand the business scale as soon as possible to form a favourable circle. This will also need to have a more long-term cooperation. For private CCL, the partner is essential to the development. However, there are always discriminations on small or middle size companies by famous enterprises, and contract is difficult to set on condition of distrust.

(3) Lack of funding support

As other private enterprises, when the private CCL enterprises become bigger, at the same time, they have to face a further delayed accounts of shippers and the rejection from banks for the loans. 2007, when Rongqing Logistics decided to increase investment in inter-city distribution and breakbulk frozen goods, funding is not a small bottleneck. So the speed of private CCL scale expansion is very slow with this limitation .

## **4. 2 Different Cold Chain Levels and Corresponding Fatalities Analysis**

### **4. 2. 1 Levels of Cold Chain**

#### **4. 2. 1. 1 Refrigeration**

Fresh meat, fruits and vegetables, milk and low-temperature preservation medical supplies need this preservation, in which measured temperature was 0 °C to 4 °C below the refrigeration environment to maintain the freshness.

#### **4. 2. 1. 2 Soft – Frozen**

The scope is -7 °C to 0 °C below the freezer. Chinese Academy of Preventive Medicine proved that: -7 °C soft space can frozen with both nutrition and convenience, and meet the need of cutting frozen meat immediately. -7 °C temperature in the refrigerator, frozen food, especially meat is convenient according with people's living habits.

#### **4. 2. 1. 3 Deep Cold Frozen**

On the market, all kinds of frozen foods, meat, poultry, ice cream and other goods are all freezing cold products, such foods generally quick-frozen in temperature of -30 °C, and then -18 °C freezing in following storage and circulation .

The cooling products usually need for different conditions of low temperature processing and circulation with different varieties, which give the professional third-party CCL more challenges.

## **4. 2. 2 Analysis on Different Cold Chain Equipment**

### **4. 2. 2. 1 Refrigeratory**

According to A.T. Kearney analysis, the cold storage area in China is less than one tenth of American in 2007. However, Increasing emphases on the cold chain in society, promotes the construction of refrigerator.

2006, a group of CCL bases were constructed. November 2006, Sinotrans CCL centre opened in Shanghai, with an area of 70,000 square meters, six temperature logistics centres, six warehousing regions and a closed-end loading terminal. The establishment of a sound and efficient mode of structure, is able to offer customers the economy, streamlined, comprehensive integration of CCL services. In early 2006, Beijing Jingkelong Fresh Food Distribution Centre officially put into use, started to provide the unified distribution services to more than 160 fresh food shops in Beijing. In May 2006, Jiangsu Tianyun Logistics Co Ltd was established and a frozen logistics centre project of 20,000 tons put into operation in Lianyungang. Development Zone. The frozen logistics centre will be completed by the end of 2008, and will become a frozen logistics centre with the largest storage capacity in region of north Jiangsu province<sup>11</sup>.

The emergence of CCL bases in these two years will improve the environment for the development of CCL, promote professional third-party logistics company's rapid increasing, and take the heavy responsibility the completeness of CCL gradually.

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<sup>11</sup> Summary report of Chinese refrigerated market(2008).

Website: <http://www.tb2b.com/info/detail/34-3122.html>

#### 4. 2. 2. 2 Refrigerated trucks and vehicles

At present, China has only 30,000 refrigerated trucks, less than 1/6 of the United States and 1/4 of Japan. In the railway operation, the country total has 338,000 vehicles but refrigerated railway cars was only 6,970, accounting for only about 2 % refrigeration. In road transport, China is holding about 30,000 vehicles, with a lower ratio than other countries (see Table 4.1). In China, capacity has meet only 20%~30% of frozen products' need<sup>12</sup>.

Table 4.1 Ratio of refrigerated cars in different countries

Country	China	the U.S.	Britain	Germany
Ratio	0.3 %	0.8 % to 1 %	2.5% to 2.8%	2 % to 3 %

Source: China Automotive Industry Yearbook (2005)

Structures of refrigerated road transport in China have the following characteristics:

(1) In the past, the cold transport teams obeyed the plans of transport from departments in charge of the team allocation and distribution. These department mainly worked on commercial, food import and export business of aquatic products. Now the team changed to the form of 3PL provider, they can make their own decisions in accordance with market demand for transport. With meat, fish, poultry, eggs food supply exceeding demand, supply plan cancelled in the allocation. The ratio of long-distance allocation transport reduce, at the same time, short-distance transport of the distribution increased.

(2) Originally frozen meat, poultry, aquatic products accounted for the vast majority of perishable goods. Now fresh meat, poultry, aquatic products account for

<sup>12</sup> China Automotive Industry Yearbook (2005)

a considerable proportion. Fresh food such as fruits, vegetables, dairy products, cold drinks, health food products also required refrigeration, insulation, and preservation vehicles to transport.

(3) Vehicle tonnage structure changes in the ratio of heavy, medium and light, from 10% and 70%, 20% respectively, to 10%, 40%, 50% respectively. As the market area development, number of frozen cars in China was also rapid growth: in 1980 about 3500, in 1985 about 6000, in 1990 about 10,000, in 1995, about 15,000, and now about 30,000. The annual sales are more than 4000. When the economic model was planned economy in China, frozen cars always used for food import and export of aquatic products business. Now the customers of frozen cars enlarged to large food stores, market, supermarket, food, dairy products and cold drinks manufacturer, accompanied with the development of specialized 3PL enterprises.

Table 4.2 Sales Volume of China's refrigeration vehicles from 2000 to 2004

<b>Year</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
<b>Insulation vehicles</b>	2717	2025	1973	2339	2241
<b>refrigeration vehicles</b>	1176	1095	1485	1688	1559
<b>Preservation vehicles</b>	110	578	159	144	-
<b>Total</b>	4003	3698	3617	4171	3800

Source: China Automotive Industry Yearbook (2005)

According to incomplete statistics of China Automotive Industry Yearbook 2005, From 2000 to 2003, frozen automobile enterprise sales income and industrial output value reached more than 600 million Yuan, industrial added value nearly 100 million Yuan. From 2000 to 2004, China's output of refrigeration vehicles in table below.

Table 4.3 Production Volume of China's refrigeration vehicles from 2000 to 2004

Year	2000	2001	2002	2003	2004
<b>Insolution vehicles</b>	2792	2050	1938	2430	2169
<b>refrigeration vehicles</b>	1179	1087	1483	1736	1577
<b>Preservation vehicles</b>	107	579	157	169	
<b>Total</b>	4078	3716	3578	4362	3746

Source: China Automotive Industry Yearbook (2005)

#### 4. 2. 2. 3 Logistics Incubator

Refrigerated trucks transport only applies to the transport of goods in large quantities. For refrigerated trucks, its principle is to use the work of refrigeration compressors as cold source. When oil prices rising today, this distribution model will undoubtedly bring additional costs, which can not be ignored, to the customers. It also led the frozen distribution expectations of a lot of the domestic cold chain distribution companies become a bubble.

High-quality logistics incubator can avoid this problem. Logistics incubator emerged in the developed countries in the early 1980s to innovate a highly efficient logistics equipment. The frozen goods and refrigerated goods were loaded at different temperatures inside the “cold chain incubator”, which is controlled by the different cold storage agents in incubator, then loaded together with the normal temperature goods in a lorry in general distribution. This is not only able to fully guarantee the distribution quality of refrigerated cargo, but also can make effective use of common vehicle distribution capacities, and reduce the purchase of refrigerated trucks, reduce

distribution costs, gain more profits on environmental protection and energy conservation.

Using incubators mode of transport operation, enterprises will face its difficult in pre-investment, high operating costs, professional management and other issues. Therefore, more and more will consider the choice of 3PL to do the CCL business, in order to avoid the high investment of self-brought infrastructure, equipment, network and human resources.

### **Summary:**

At present, the overall market size of Chinese third-party CCL industry is not large, Both of stated-owned and private CCL have their advantages and disadvantages. Third-party CCL are still at the start-up periods. The construction and purchases of equipments and facilities although have been thought much of, the current supply can not cater for the requirement. Regional characteristics is a strong without the integration of resources. Influential, national third-party CCL industry leaders, overall, is still at the initial stage

Professionals said, from development trends of the distribution of food and medicine refrigeration logistics. It is an sensible choice for the Chinese production and distribution enterprises to use a third-party CCL with high-performance to ensure low-temperature processing. So the supply side of CCL market should be more active in future.



## **CHAPTER 5 THE EXISTING PROBLEMS AND COUNTERMEASURE TO CHINESE THIRD-PARTY CCL**

### **5. 1 The Existing Problems of the Chinese Third-Party CCL at Present**

#### **5. 1. 1 Problems of Hardware**

##### **5. 1. 1. 1 Less cold-chain infrastructure construction**

China has built a number of logistics centres, but the project involved in the CCL is rare. Low-temperature centre is a very important aspect throughout the CCL, also the base where cold-chain products stay a long time in the supply chain. It occupies an important position in protecting the quality of the product. Although in the past two years, the emphasize on the construction of cold storage centre is increasing gradually. However, development of automation refrigerated warehouse is still in its infancy, and these projects have to go through a certain period of construction before they come into use. With the economic development, a number of automated refrigerated warehouses should climb to a considerable size, but compared with the estimated, it is still unable to meet the needs of market demand.

##### **5. 1. 1. 2 Huge number of obsolete equipments affect the quality of CCL**

Frozen transport is a very important aspect in the cold chain, bad transportation equipment or negligence transport operations will expose food to high temperature environment, which damage the quality immediately. So the choice and the use of refrigerated equipment are the key factors to a success transportation. But small

modified car factories rush into the this not big market. And in order to occupy market shares, refrigerating machine and the core components of freezer compartment are jerry. Normative factories collapsed in the unregulated competition. However the enterprises who are still alive can not make profits by low prices and poor quality too.

In the frozen during transport, one of the main reasons which caused decline in the quality of food is temperature fluctuation. However, most of the current domestic food distribution channels don't fulfil the requirements of strictly controlled cold chain. For example, vegetables must be in full control of 0 °C, fish and meat products in -18 °C under transport. But domestic logistics are unable to do and products may have hidden quality dangers in transition. More than 60% of the retailers receive goods without temperature measurement. In this regard, a safety officer of Yum! Restaurants in China said that, at present the community of 3PL can not meet the requirement, so in China we have to be responsible for our own transport.

## **5. 1. 2 Problems of Software**

### **5. 1. 2. 1 Lack of awareness on the overall cost**

At the current stage of the CCL, the concept of total cost is almost never mentioned. Enterprises focus on cost and price, without considering how to reduce the loss of the goods through the use of qualified logistics service providers, however, the wastage of CCL is considerable. This is also a serious situation of Chinese logistics at present. In the absence of overall understanding of CCL, the phenomenon of breaks in the

cold chain is very often: Some providers also want to use the standard car, but retailers and does not give extra care. They do not give additional bonus because a supplier provide better CCL services. This indirectly encourage suppliers to use non-standard vehicles. Not conducive to the development of the industry and cold-chain quality assurance.

#### **5. 1. 2. 2 Low level of management method**

From farm to the wholesale market, fresh goods are usually not dealt with pre-cooling in the primary processing and not sorted in low temperature refrigeration environment. Transportation condition can not be optimism too: the shipment and loading of perishable food, mostly in the open air and not in accordance with international standards of cold storage operations in food insulation. Many enterprises in such circumstances choose some underwork: after starting the vehicle, only at the start and finish point, the cold machine is open, while closed in the middle process.

And at the present, generally speaking, Information systems of China's 3PL enterprise are not at high level. Functions of information systems are not strong enough for professionalism of the application, and are usually not compatible with customer information systems. In addition, the current automation facilities of 3PL enterprises are in the low degree, many operators still remain in the traditional manual stage, which means a low efficiency, high costs the not able to meet the specific requirements of CCL.

#### **5. 1. 2. 3 Lack of relevant qualified personnel**

Logistics enterprises often have a weak sense of personnel who understand both the information technology and logistics well. These factors also hindered the information progress of logistics enterprises. Although in some large enterprises, infrastructures are very advanced, the management of person has not reached a certain level. For them, the most important is the training of cold-chain management personnel from different channels(see Figure 5.1) and the establishment of a good management system. After all, the development of modern CCL in China is still not mature, lack of cold-chain management and talent. 3PL also need to carry out their work and personnel training actively to develop and strengthen itself.

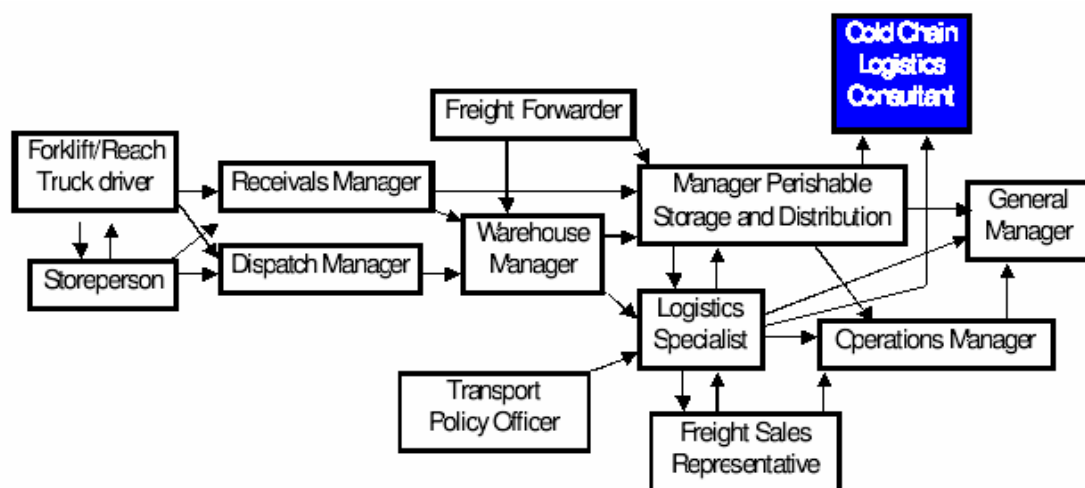


Figure 5.1 Possible career paths of CCL specialists

Source: Logistics Information and Navigation centre <http://www.the-linc.com.au>

The fourth-party logistics management is method to manage and optimize social resources with professional talent. It is an output management that weight management more than assets. If persevere to manage the process through 4PL, social resources will be integrated better. Even if the cold storage and vehicles are older, with the leading management tools such as the qualified personnel,

optimization of routes, global certification, there can be a position in market. On the contrary, if people can not be trained step by step in the enterprise culture, it will be a major constraint of the long-term development.

#### **5. 1. 2. 4 Lack of government departments and demand enterprises attention**

The Government should further enhance the implementation of the cold chain rules. Although there are laws and regulations correlative with the food safety, the government pays more attention to other areas (such as product origin, health problems, etc.) than the CCL. They do not check the quality throughout the CCL very often. Enterprises, who are intended to establish their own brand names, may sett the operation standard of CCL, but it needs a long-term progress. Therefore the relevant government departments need to strengthen the food supply chain and implement the supervision rules to guide the development of the formal CCL enterprises, while not to rely on companies self-discipline. In Shanghai, some retailers strictly require the use of refrigerated trucks, this requirement is the highest in China. It is also relevant with the provisions of industry standards introduced by Shanghai local government.

Now the signed contracts between third-party logistics and cold chain demand enterprises, mostly are set yearly, so there less likely to be a longer investment. Now the integrity of the two sides has not be established yet, most of which are the short-term behaviours, it is not conducive to long-term cooperation. Long-term strategic cooperation in the absence of this industry is also constrained factor of the development.

## **5. 2 SWOT Analysis on Chinese third-party cold chain logistics**

### **5. 2. 1 Internal Strength and Weakness**

#### **5. 2. 1. 1 Strength (S)**

##### **(1) Professionalism**

The third-party CCL provider should have the ability to deal with the professional goods, They know how to deal with different cargos of different temperature requirements. And they have more experience in the operation than ordinary 3PL.

##### **(2) Flexibility**

A shipment of fresh cargo sometime can not fulfil the capacity of a refrigerated trucks. But the third-party CCL can finish the transfer process with a lower cost as well. Because they have many shipments, and with a completed network of cold chain, the flexibility of transport will become implementation with the economics of scale.

##### **(3) Efficiency**

For the enterprises self-employed logistics, their work depends on the demand of the company. When there are no jobs from inside company, the capacity of cold chain will be idle, which means a waste of capital cost on investment. However, a third-party CCL company will have more customers in the market, the efficiency of their work will be more obvious.

#### **5. 2. 1. 2 Weakness(W)**

(1) Inadequate hardware facilities and equipments.

As mentioned before, the weakness of the hardware will effect the quality of cold chain to a large range.

(2) Management levels mixed.

The management of different CCL showed different levels. To most state-owned enterprises, it is not a burden to buy an advanced information system, But for private companies, the management still use the traditional human resource to make each decision, the mistake may be unavoidable.

(3) Lack of support from long-term cooperation enterprises

The Lingxian logistics and Havi Logistics are relying on the Bright Dairy and McDonald's, It is more difficult to develop if there are not major customers. The internal improvement of logistics enterprises and how can they do a good job further for their services is also a question.

## **5. 2. 2 External Threaten and Opportunity**

### **5. 2. 2. 1 Threaten(T)**

(1) Manufacturers and retailers tend to use self-logistics

Most manufacture companies have their traditional department of transport. They do not want to cancel these part of companies. And the third-party services providers is crucial to the quality of products. Whether the third-party CCL is trustworthy is an essential question to the companies.

(2) The public lack of understanding of professional CCL

Most people from public do not know the conception of “Cold Chain”, the CCL is not an important operation in their imagination. So, the attention of whole society to third-party CCL is lack, which makes negative efforts to the third-party CCL.

(3) Vicious competition leads outsiders suspect the future of the CCL industry

There are few large-scale companies who provide regular third-party CCL services, more guerrillas besiege the regular forces, some third-party logistics use price competition, more potential customers will stop using the formal service. Maintain the industry quality of service at a low level

#### **5. 2. 2. 2 Opportunity(O)**

(1) Market demand is huge in China

There are a lot of perishable food that did not enter the cold chain, the market potential is inestimable. And for the concentration of core competitive advantages, more and more production enterprises will turn to third-party CCL.

(2) Economic development improve people's standard of living

People begin to pay more attention to food and medicine safety. It is the results of social development, also the key to the development of China's cold-chain, mainly an important trend by the development of market supply and demand relations.

(3) New policies and regulations stringent industry standards is conducive

Government put up the increasingly strict regulations and give increasing awareness of cold chain, suppliers are also constantly request of the demand for formal cold chain. It is a protection to the high-quality third-party CCL development.



### 5. 2. 3 SWOT Table Analysis

Table 5.1 SWOT Analysis on Chinese third-party cold chain logistics

<p><b>Internal factors</b></p>	<p><b>Strength (S)</b></p> <p>(1) Professionalism (2) Flexibility (3) Efficiency</p>	<p><b>Weakness (W)</b></p> <p>(1) Inadequate hardware facilities and equipments (2) Management level mixed (3) Lack of support from long-term cooperation enterprises</p>
<p><b>External factors</b></p> <p><b>Opportunity (O)</b></p> <p>(1) There are a lot of perishable food did not enter the cold chain, market demand is huge in China (2) economic development improve people's standard of living, they pay more attention to food and medicine safety (3) new policies and regulations stringent industry standards is conducive to the protection of high-quality third-party CCL developmen</p>	<p><b>SO strategy</b></p> <p><b>Use strengths to take advantage of opportunities</b></p> <p>(1) Enlarge the service scopes and covering areas to meet different demands of customers. Get profit from economics of scale. (2) Improve the quality of service, the working guidelines should based on customers' need. In the operation of cold chain, monitor each process to ensure the service level (3) enhance the publicity of cold chain according to the policies</p>	<p><b>WO strategy</b></p> <p><b>Take advantage of opportunities by overcoming weakness</b></p> <p>(1) Strengthen the maintenance of facilities, wash out the equipments which can not the fulfill the industry rules. (2) Introduce advanced information techniques to manage the cold chain process, as well as personnel with suitable skill (3) Try to build a long-term relationship with major client, make improvement with their requirement.</p>
<p><b>Threat (T)</b></p> <p>(1) Manufacturers and retailers tend to use self-logistics (2) The public lack of understanding of professional CCL (3)Vicious competition and lead outsiders suspected to future of the industry development</p>	<p><b>ST strategy</b></p> <p><b>Use strengths to avoid threats</b></p> <p>(1) Attract the customers with lower price, higher efficiency and better service (2) Disseminate the concept of third-party logistics and the culture of CCL. Make the brand wellknown by the public.</p>	<p><b>WT strategy</b></p> <p><b>Minimize weaknesses and avoid threats</b></p> <p>(1) join part of cold chain business of manufactures or retailers, then try to long-term cooperate with them to make (2) Focus on a special market, do diversity business with other companies. Do the jobs what others can't do</p>

## **Summary:**

SWOT analysis is usually used as environment analysis of a company, but in this dissertation, the author also applied it for the analysis of the whole industry situation of third-party CCL. Although the third-party CCL in China have their problems on both hardware and software, the market demand will give more opportunities than challenges to the future.

The improvement of third-party CCL should not only focus on the internal condition of each logistics providers, but the macro environment is important as well. Only the companies who can see the front view clearly and have a accurate market position strategies can gain the market share in a long period of time. The countermeasures are given in this chapter, but different third-party CCL should choose measures which are useful to themselves based on the market trend and their future goal .

## **CHAPTER 6 SUGGESTIONS ON THE DEVELOPMENT OF THIRD-PARTY CCL**

### **6. 1 CCL Changes from Enterprises Self-Employed to Third-Party Outsourcing Operation**

Many private cold chain enterprises come from the logistics departments of large ice cream enterprises, such as Wall's, Nestle, Mengniu. In the strategy of contraction on the logistics costs in the industry groups, these stripping department become the independence sector of "third party". One person worked at Nestle markets department said: At the time, these third-party companies who earned "the first bucket of gold", had expanded the scale already.

#### **Case: Lingxian Logistics - from the Transport Sector of Bright Dairy to Professional Third-Party CCL**

Shanghai Lingxian logistics Limited (Shanghai Lingxian logistics Limited, referred to Lingxian logistics), established in 2003, is a wholly owned subsidiary of the Bright Dairy. Inherited more than 20 years experiences of room temperature dairy operating, customer service, retail-oriented modern refrigeration from the Bright Dairy, By 2005, Lingxian logistics had set up a modern cold storage distribution centre and a national coverage logistics network in Shanghai, Hangzhou, Ningbo, Nanjing, Suzhou, Wuxi, Hefei, Jiaxing, Huzhou , Changzhou, Wuhu, Guangzhou, Tianjin, Wuhan, Chengdu, Xi'an, and other places, Especially in Shanghai and East

China the logistics network can offer more than 16,000 “door to-door” service delivery, cover of all the basic stores, supermarkets, convenience stores and other retailers and some restaurants in Shanghai and East China.

With good logistics infrastructure, excellent operating management personnel, efficient operational efficiency and rich experiences on food logistics, Lingxian Logistics has been agreed with the customers of industry. At present, Lingxian Logistics has established a good relationship of cooperation with a variety of form customers such as Bright Dairy, Xu Yang bean curd, Nanjing Yurun Food, Tyson food from the United States and Shanghai's Kedics convenience stores. And the customer base is still the fast-growing. Lingxian Logistics expects to sharing a win-win situation with all potential clients<sup>13</sup>.

In the model case, the third-party CCL changed from the transport sector usually closely connected with 1 or 2 large manufacturers companies, making them highly dependent on the business. The customers' attitudes to some extent affect the quality to their products and management. One of its logistics division manager said: logistics of Bright Dairy went through a conversion from enterprise's logistics to logistics enterprise, the change aimed at third-party CCL. Face of China's rapid development of the logistics industry in the market, as other 3PL, Lingxian Logistics look forward for the cooperation in joint development with other advanced international logistics enterprises.

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<sup>13</sup> Joint Investigation Report of Bright Dairy(2006),  
Website: <http://www.foodqs.com/news/gnspzs01/20038212066.html>

## **6. 2 Improve CCL Information System**

The cold chain is a huge project, and compared to room temperature storage, distribution and transport, cold chain is unique not only in the construction, but also in the insulation and cooling technique. There are more demanding in management of scientific, technical, security and other professional characteristics, so it more complex. A CCL information system is crucial for the entire cold chain in real-time monitoring and feedback, plays an important role to the cold-chain management. The CCL information system can provide accurate information and communication from market for the cold-chain parties who concerned, and it also provides traceability information support for food safety inspectors.

### **Case: Logistics management information system of Bright Dairy**

In information management systems, Lingxian Logistics develop the Warehouse Management System (WMS), Transport Management System(TMS), the Digital Picking System (DPS), Serial Test Tasks System(STTS), and Temperature Control System for food logistics with world-renowned logistics software developers - BoKe LIMS (Logistics Information Management System) to provide effective operational support<sup>14</sup>.

#### **WMS (Warehouse Management System)**

WMS in accordance with the operation of the business rules and (algorithms), of information, gives a more perfect management of resources, acts, inventory and

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<sup>14</sup> Sun Jing(2007). *Logistics Systems Planning and Evaluations Studies on Third-Party Cold Chain Logistics*. Master Research Paper. Agricultural University of An hui Province

distribution operation f to maximize the output and effectively meet the requirements of accuracy. WMS system, brings five major benefits to the effect: to reduce production downtime, to avoid picking the wrong result of production delays, to lower Picking cycle, to respond quickly to market changes. To monitor the inter-warehouse inventory scheduling, and to optimize the cost of personnel, facilities and equipment

### **TMS (Transport Management System)**

TMS resolve the problems of the dynamic assessment on each vehicles transportation costs to, in order to reduce logistics costs of providing the raw data accumulated on the basis of figures. In addition to economic indicators, vehicle management system, the team's performance targets, indicators of quality, safety targets, indicators are also in the comprehensive assessment. Provide reliable data to the team management and reduce transportation costs. Increases the team's overall level of service.

### **PMS (programme management system)**

### **DPS (Digital Picking System)**

### **STTS (Serial Test Tasks System)**

### **Vehicle Temperature Control System**

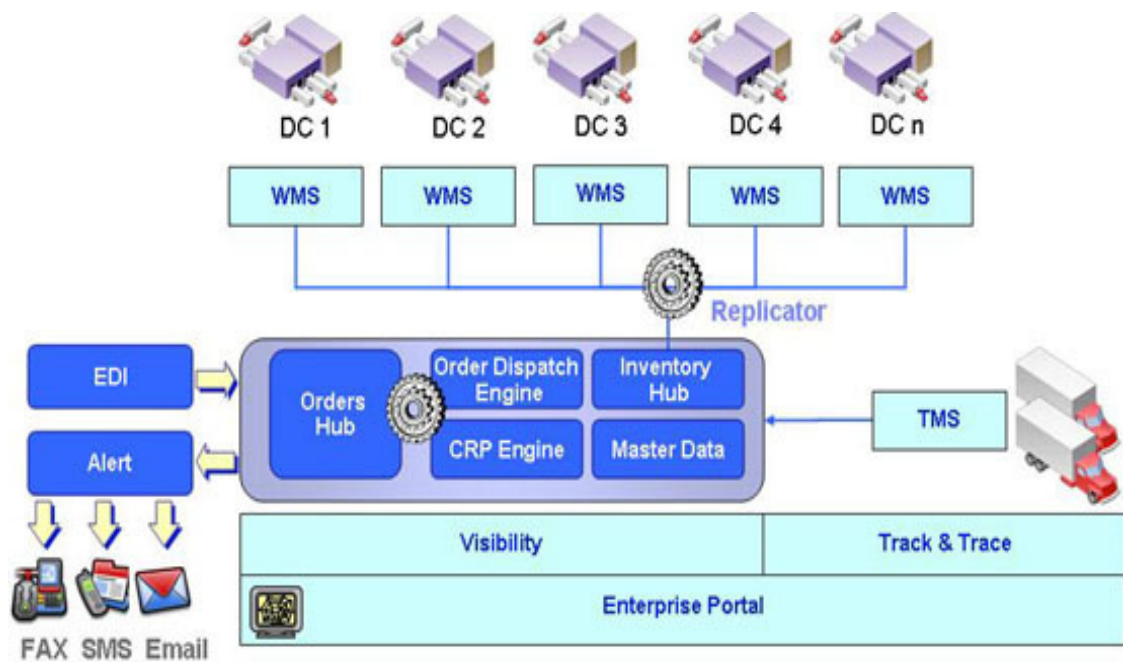


Figure 6.1 Structure of Information System in Bright Dairy

Source: Sun Jing(2007). *Logistics Systems Planning and Evaluations Studies on Third-Party Cold Chain Logistics*. Master Research Paper. Agricultural University of An hui Province

### Simplify information system

The dealer stores will transmit the immediate sale of POS information back to the WMS of Bright Dairy, in accordance with the sales a replenishment of these stores every two hours is conduct to the stores directly. As long as the headquarters of the Bright Dairy warehouse guaranteed their own inventory not shortage, the WMS ensure that all the stores not in short supply, the headquarters handling the billing relationship with the dealer. WMS just do a good job in inventory management for 3 - 5 days of inventory. To let professional people to do professional things.

## **6. 3 Government Support and Policy Guidance Role**

### **6. 3. 1 Policy relative to the CCL in other countries**

1975, in order to further improve the research level related to cold-chain issues, the Japanese Agriculture Ministry set up a low-temperature food distribution Promotion Council, the study sorted out *Methods to manage low-temperature management of food quality and to improve low-temperature flow facilities* and developed a food temperature zone of Low-temperature flow, that is, the flow of fresh food temperature of -4 °C to 5 °C, and issued a *cold chain Guide*, fresh food cold chain storage technology into the basic sound stage.

The United States in 2002 set up a cold chain Association, the Association of airlines, trucking, ground equipment handling and component manufacturers, research the issues relating to perishable goods, and develop standardized guidelines for transport temperature control. U.S. cold-chain Association issued a *cold-chain quality indicators*, and claimed that this standard can be used to test the transport, handling and storage of perishable goods businesses with the reliability, quality and proficiency. and lay the foundation for certification of the whole of perishable goods in the supply chain.

Several years ago, the Australian government partnered with private industry to pilot a national, end-to-end, cold-chain framework. The focal points of the program were a quality analysis of the export supply chain for each exporter and the development of quality management service agreements between exporters and their supply chain partners. With these tools, contractors can avoid duplication by integrating performance standards and processes with those of their supply chain partners. The



pilot led to a nationally accredited, voluntary logistics management system that is now open to all Australian exporters. Buy-in has been received from numerous airlines, shipping companies, refrigerated transport companies, freight forwarders and freight terminal operators. By capitalizing on the expertise of a qualified partner, the Australian government embodied a key aspect of high performance and enabled itself to quickly and cost-effectively exploit positioning advantages in the value chain and achieve optimal scale<sup>15</sup>.

### **6. 3. 2 Policy relative to the CCL in China**

In addition to not form a complete and independent system of cold chain, cold chain and food-related national standards are still blank. standards of food safety are lack in China. As the core of the legal system, China's existing <Food Sanitation Law>. developed market access criteria, labelling regulations, sample detection method, but does not require the norms and notes of safe operation in transportation and circulation. Like a "dumbbell" model, that is, production and the saling terminals are emphasized, but lack of effective monitoring for the circulation link, which is bound to become cold-chain food safety hidden dangers.

### **6. 3. 3 Local roles in promoting industry standard**

At present, Shanghai took the lead in the introduction of local foods CCL industry standards, <the food CCL technology and management practices>, came into promulgation and implementation from October 1, 2007. The standards require temperature control in the flow of food cold chain processes, refrigerated transport,

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<sup>15</sup> Leading practice: The Government of Australia Creating an effective China "cold supply chain" Current status, challenges and implementation considerations *Accentune*

refrigerated storage, wholesale trade, distribution terminals, processing and marketing sectors. has also added the requirements of health management quality. For example, the standard requirements of liquid milk (drinks) before the hand loading the body to be loaded should pre-cooling temperature of 15 °C; transit product temperature no higher than 10 °C; the temperature must be clear Requirements when delivery business units commissioned by the cold chain distribution carrier; when chilled, or frozen food to reach the receiver, frozen products should be within 15 minutes, frozen products loading and unloading should be finished within 30 minutes.

Shanghai began building pilot cold chain which start with meat, aquatic products, soybean products in a three-year period to achieve the following goals: 90% of the main processing industry complete cold-chain processing, 90% of wholesale market use the cold chain without disrupting, 90 % of logistics and distribution form a complete cold-chain link. The promulgation of <food CCL technology and management practices> will make the operation of the CCL industry further standardize. Provide a reliable technical support to the Shanghai food security .

#### **6. 4 Set Up Cold Chain Alliance**

For the domestic CCL, Kearney research said, not a single company can establish a set of cold-chain infrastructure, which required the joint of all aspects, including government support in terms of coordination and industry organizations. Kearney's idea is to set up a union of customer, operators and investors to seek common solutions, the programme must not only meet the domestic demand, but also with international standards.

Therefore, Kearney suggested, China should imitate the western developed countries, establish of an integration CCL model to satisfy the consumers, suppliers and retailers in three areas of demand, that is, goods will be transported from suppliers of to major cities in CCL integration centre, after the integration, they are long-distance transported , to regional integration Centre for packing and deliver for local transportation, and integrated directly sent to marketing retail points. In the whole process there are strict temperature control and real-time monitoring, trained staff need to grasp the correct handling and storage methods, and through these areas to protect food safety.

China Chain Management Association said that the development of CCL is a systematic project, but also need policy support from all levels of governments, to establish the food cold-chain standards as soon as possible, make these standards integrated into the food market access system, establish effective monitoring mechanism and strict monitor perishable foods in the cold chain in all sectors of the running state. At the same time to speed up the construction of information systems. so that can guarantee the cold chain good and logistics moving in the right direction, then take full advantage of the existing cold chain facilities, minimize the cold chain food costs. So it can reach ordinary consumers' acceptable level as soon as possible .

## **CONCLUSION:**

Because of the increasing need of food and medicines safety, the phrase of “Cold Chain Logistics” will be widely recognized by more and more population. But the Cold Chain is not only a conception that can be known, but also should be norms for the development of the logistics industry. It should have positive effort to guide the direction and future development with a clearly rules.

The CCL have a closely linked with the economic indicators, especially the indicators of Wholesale, retail trade and catering industries. So in China, with the development of society and urbanization, the CCL will have a bright future.

There is no doubt that the third-party CCL is a wise choice for both sides of the cold chain. But the different origin of third-party CCL will give different performances in the market. Both state-owned and private their-party CCL have their pros and cons, but the market competition will give logistics providers heavy pressure to suit for the market demand. Even though the supply side of market can not meet the need of requirement, the competition is still brutal. The lower prices service providers can possess market at one time, but for long-term competition, only the better customers service provider can maintain an stable position.

And for the development of long period, the cooperation with customers is very essential. Some leading third-party CCL coming from the transport department of production enterprises, have the more natural advantages, their relationship with major customers are more closely than other CCL. And to some extend, the

development of third-party CCL depends on their major client. To enlarge their customers and be more professional in service is a better choice for them.

And the application of information system is another key factor to improve service level, with which the control and monitor of whole cold chain will be more efficient. For the 3PL, the IT system should be compatible with both the first party-shipper and the second party-consignee. The reaction will be faster with a good correlations.

Above all, the third-party CCL should be emphasized by the whole society, the state should publish appropriate Laws and Regulations, the public should pay more attention to the third-party CCL as well. The alliance between can be set up not only between different parties, but also between competitors. These actions will improve the social resource integration, and create a more comfortable environment for the third-party CCL to improve the cold chain quality and production safety.

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