

Enhance Food Safety With Less Cost

Emerson Climate Technologies China Cold Chain Study

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Executive summary

Chinese consumers are embracing a modern lifestyle, and their shopping behaviors are evolving. The changes in their shopping behaviors are not only reflected in the fashion and luxury landscape, but also in shopping for necessities such as food.

Nowadays, more people visit supermarkets to purchase food, and the food retail industry is growing rapidly in China. The consumption of refrigerated and frozen foods has also increased over time. These trends have created business opportunities for many retailers. However, food safety is a key concern among Chinese consumers and it may adversely affect the growth of the industry if not managed appropriately. Food retailers are paying close attention to how consumers perceive food safety issues, particularly the handling of refrigerated foods, when they shop in supermarkets and convenience stores.

The **“Enhance Food Safety with Less Cost - Emerson Climate Technologies China Cold Chain Study”** consists of a *consumer survey* and a *DIA supermarket case study*. The study aims to enhance the understanding of Chinese consumers’ purchasing behaviors when it comes to refrigerated products and their knowledge of proper food handling and storage. It also provides insights on how supermarkets can enhance their market competitiveness by leveraging the latest technologies to further improve food safety and reduce operating costs.

The survey reveals that 62% of Chinese consumers have increased their food purchases from supermarkets in the last 12 months. Among shoppers who increased their spending, 60% of them believe that the food sold at supermarkets comes from more credible sources. Fifty-four

percent of consumers purchase more food from supermarkets because of the quality refrigeration equipment and clean shopping environment. Food safety is a significant driver of change in Chinese consumers buying behaviors.

However, the survey also shows that consumers generally lack knowledge on how to handle and store foods. Forty-three percent of consumers believed that expiry dates were always valid regardless whether foods are transported and stored properly. Only 24% and 18% of consumers know frozen meat and frozen seafood, respectively, should be kept below -18°C . Most consumers don’t know what “frozen” means in terms of temperature. Clearly many consumers are not equipped with the knowledge they need to protect themselves against the threat of unsafe food.

On the other hand, it is challenging for supermarkets to meet the higher food safety expectations of consumers while keeping operating costs low and maintaining a good margin. The DIA case study illustrates that a supermarket could use an intelligent store concept from Emerson to monitor and control equipment in real time to improve food safety, and save an average of 24% on energy. The payback period of the upgraded refrigeration equipment is within two years!

With this study Emerson seeks to help drive the development and enhancement of the cold chain infrastructure in China by sharing the latest market insights and best industry practices. This study concludes that an upgrade of the cold chain infrastructure will not only enhance food safety in China, but also increase the competitiveness of food industry companies in the market.

Part 1: Consumer survey on food safety

A. Food purchase behavior is evolving in China

Chinese consumers traditionally buy fresh food such as beef, pork, poultry, fish and vegetables from wet markets, which sell meat and live animals out in the open. As China's income level rises with increased urbanization, supermarkets and convenience stores are growing in number and becoming more popular for food purchases.

From 2008 to 2013, the supermarket industry in China grew at an annual rate of 12% and the revenue reached US\$141.1 billion. Food made up the main product segment at supermarkets and accounted for 49% of total industry revenue in 2013.¹ Supermarkets in China offer a wide variety of food products. This includes fresh, chilled and frozen foods, all catering to various consumer preferences.

Chinese consumers purchase more foods from supermarkets

Emerson Climate Technologies conducted a survey in Beijing, Shanghai and Guangzhou in August 2014. The survey was conducted through face-to-face interviews with a total of 548 people, between 20 and 60 years of age. All participants are involved with food purchasing for their households. The survey was completed by CTR Market Research Co., Ltd (央视市场研究公司) in August 2014. The survey was designed to understand Chinese consumers' food buying



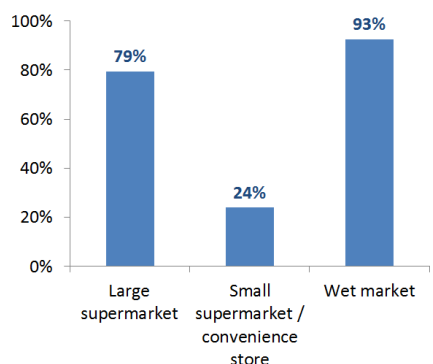
habits, knowledge of handling and storage of refrigerated foods, and the trend of purchasing food online.

The Emerson survey results show that today, more and more Chinese consumers who live in cities purchase fresh and refrigerated food items from supermarkets and convenience stores. Although 93% of the consumers surveyed still buy fresh food products from wet markets, nearly four out of five consumers (79%) also buy fresh food products from large supermarkets.

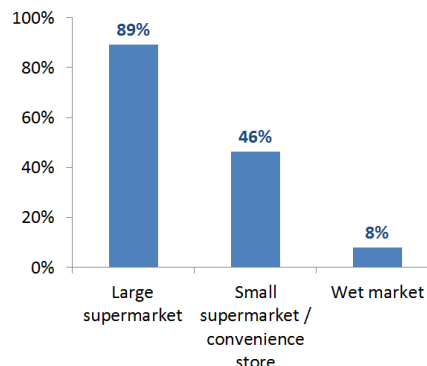
The numbers are even higher for chilled and frozen foods. Eighty-nine percent of consumers buy chilled foods and 92% of them buy frozen foods from large supermarkets compared to only 8% and 30% of consumers buying chilled and frozen foods, respectively, from wet markets.

¹ [IBISWorld: Supermarkets in China: Market Research Report](#)

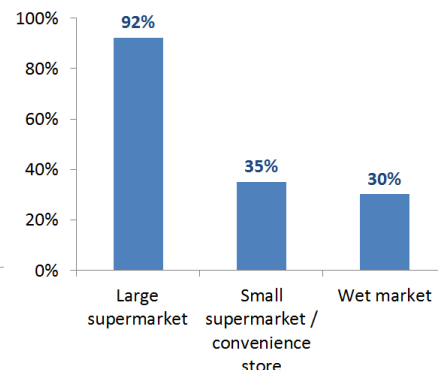
Where Chinese consumers buy perishable fresh foods



Where Chinese consumers buy refrigerated foods



Where Chinese consumers buy frozen foods



Although only 24% of the consumers surveyed purchase fresh food products from small supermarkets and convenience stores, 46% and 35% of consumers buy chilled and frozen foods, respectively, from small supermarkets and convenience stores.

Large supermarkets are more appealing to consumers, but the survey results indicate that there may be an untapped market for smaller retail players. In fact, smaller supermarkets and convenience stores have recently outgrown very large supermarkets. In the fourth quarter of 2013, the sales growth of very large supermarkets or hypermarkets was 8% while the growth of supermarkets and convenience stores were 12% and 14%, respectively.²

According to the China Chain Store & Franchise Association, the saturation level of convenience stores in the Chinese mainland is still relatively low compared with Japan and Taiwan, where there is one convenience store for every 2,000 residents. In China, the average level is around one

convenience store for every 5,000 people.³ There is still room for smaller supermarkets and convenience stores to grow.

Spending in supermarkets keeps increasing

Not only do more consumers visit supermarkets to purchase food, but they are also spending more. Sixty-two percent of the consumers surveyed said that they have increased their purchases of food products from supermarkets and convenience stores in the past 12 months. Eighteen percent of them kept their purchases at the same level and only 20% reduced their purchases. The results indicate a significant growing opportunity for retailers in China.

Among the three cities surveyed, consumers in Beijing buy food from supermarkets the most. The survey reports that 78% of Beijing consumers increased food purchases from supermarkets and convenience stores while only 4% of them reduced their purchases in the past 12 months.

Milk, yogurt, fast-frozen foods and ice cream are on top of Chinese consumers' shopping lists when they go to supermarkets and convenience

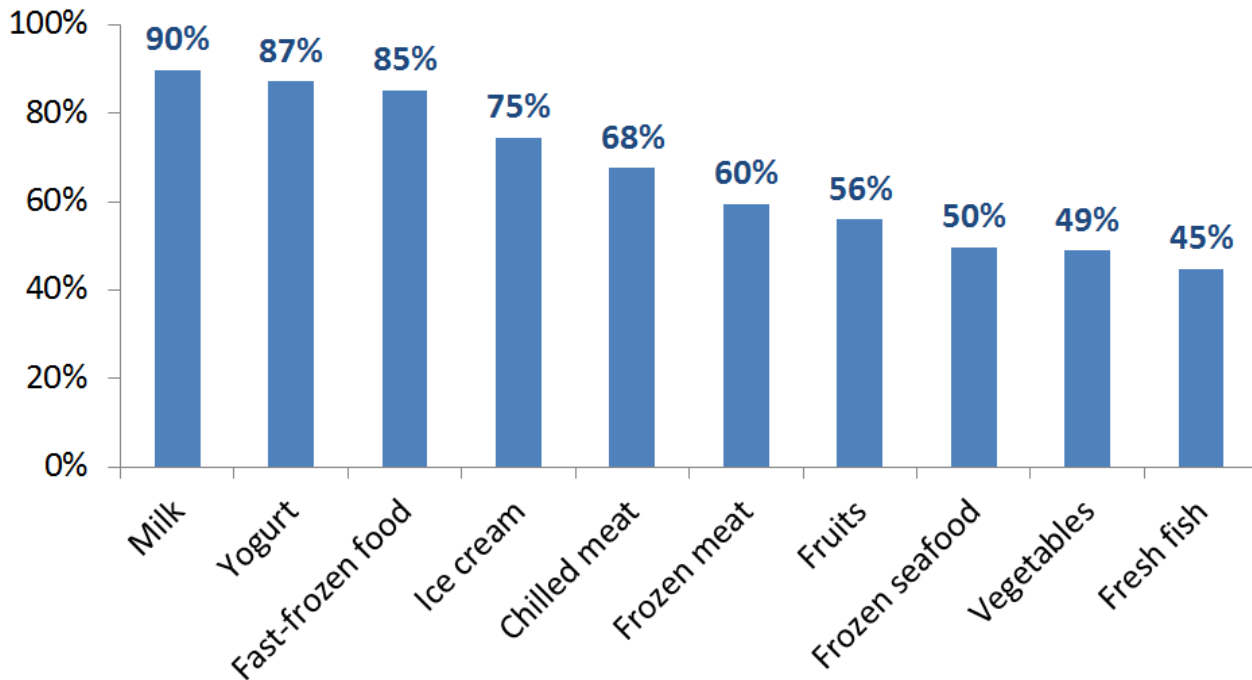
² [Fung Business Intelligence Centre: China Retail – convenience stores](#)

³ [China Daily: Convenience stores still have room for expansion](#)

stores. Most people purchase milk (90%), yogurt (87%), fast-frozen foods (85%) and ice cream (75%) from supermarkets and convenience stores.

Many consumers also purchase chilled meat (68%), frozen meat (60%) and frozen seafood (50%) at supermarkets and convenience stores.

Foods purchased from supermarkets and convenience stores



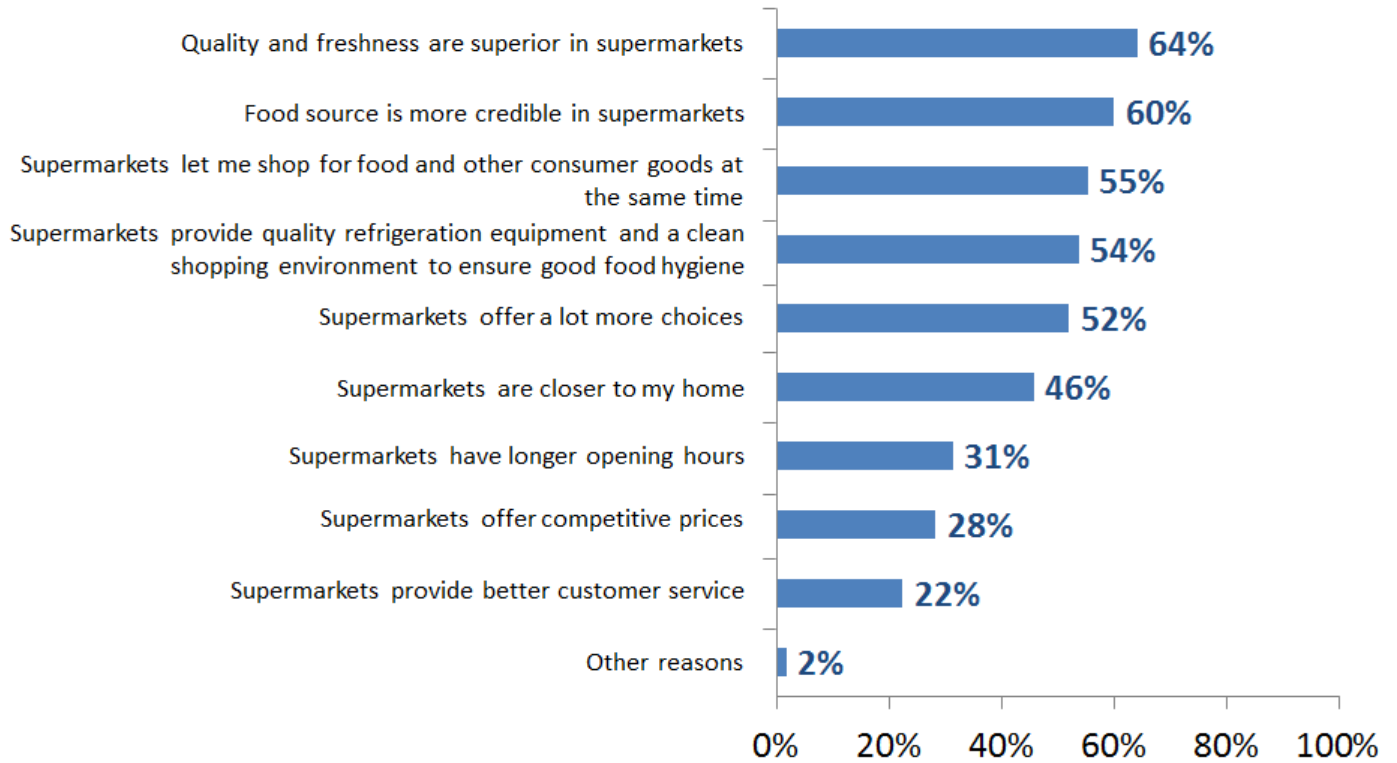
Demand for better food safety drives food sales in supermarkets

Besides the changes in food purchasing behavior, the survey also reveals why Chinese consumers buy more food from supermarkets. Among various reasons, food quality and safety are at the top of the list.

When consumers were asked why they increased their food purchases from supermarkets and convenience stores in the past 12 months, 64% of them said that the food at these venues was fresher

and had better quality, and 60% of them believe that the food comes from more credible sources. Fifty-four percent of consumers purchase more food from supermarkets and convenience stores because of the quality refrigeration equipment and clean shopping environment, which they believe is essential to ensure good food hygiene. Other reasons include more consumer goods (55%) and more food choices (52%).

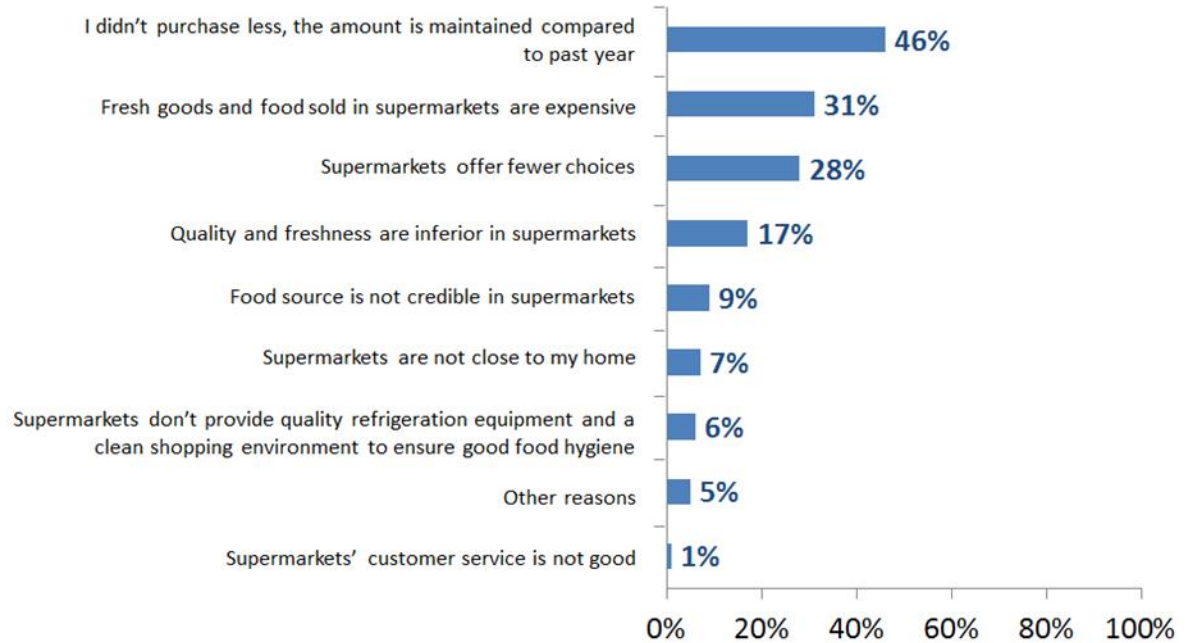
Reasons to purchase more food from supermarkets



On the other hand, higher prices (31%) are the primary reason stopping consumers from purchasing more food products from supermarkets and convenience stores.

For retailers, the key to success is to keep improving food quality and food safety while offering competitive prices to consumers.

Reasons NOT to purchase more food from supermarkets



Food purchase patterns are different in each city

Food purchases increased across all cities surveyed, however, consumers in Beijing and Shanghai appear to be more used to purchasing foods from supermarkets than consumers in Guangzhou. Ninety-one percent of consumers from Beijing and 82% of consumers from Shanghai purchased fresh foods from large supermarkets while only 65% of Guangzhou consumers did so.

Many Beijing consumers purchased chilled meat (91%) and fish (73%) from supermarkets and convenience stores while in Guangzhou only 55% of consumers purchased chilled meat and 28% of consumers purchased fish from supermarkets.

B. Consumers lack food safety knowledge

Food safety is a hot topic in China. A number of food safety related scandals have triggered concerns among Chinese consumers and directly affected the sales of food providers and restaurants. According to a Horizon Research and Horizonkey survey,⁴ most people see the source and production process in the food industry carrying the greatest risk to consumer safety. Although proper food handling and storage are important to ensure food safety, consumers pay little attention to it.

Emerson’s cold chain survey aims to find out whether consumers possess adequate knowledge of food storage and handling best practices.

Seventy percent of the consumers surveyed understood the importance of refrigeration to ensuring food safety. They know that food should be kept at recommended temperatures during the transportation and storage processes, but very few of them know what these specific temperatures are.

Only eight out of 548 people (less than 2% of the total) surveyed know all the recommended temperatures at which different foods should be kept, and how to properly handle and store food.

Why is it important to know at what temperatures different foods should be kept? Shouldn’t it be fine if the refrigerator is cold? The truth is that the lower temperature can only slow down the growth of bacteria and the required temperature to sufficiently impede that growth is different for each product. It’s essential for Chinese consumers to know the recommended temperatures for different foods in order to handle and store them properly.

For example, listeria is a foodborne bacteria which can cause listeriosis, an illness that can be particularly harmful to at-risk groups like pregnant women, newborn babies and older adults. Studies show that listeria can grow over time at refrigerator temperatures above 4°C. Thus, as a first precaution,

The consumers were asked what they thought the recommended temperatures were to store the following foods:

| Type of Food | Recommended Temperature | Consumers Answered Correctly |
|--|-------------------------|------------------------------|
| Chilled meat (beef, pork, chicken, etc.) | 2°C | 28% |
| Fresh milk | 4°C | 68% |
| Yogurt | 4°C | 67% |
| Frozen meat | Below -18°C | 24% |
| Ice cream | Below -18°C | 23% |
| Frozen seafood | Below -18°C | 18% |

⁴ [China Daily: Dissatisfaction with food safety pervasive, survey finds](#)

a refrigerator should be kept at 4°C or below and its freezer at -18°C or below.⁵

Consumers first need to know the right temperature, and then they can check if their refrigerators are kept at the ideal temperature. Their lack of accurate information may lead to improper handling of refrigerated foods, increasing the potential for food spoilage and food-borne illness.

In September 2014, the Standardization Administration of the People's Republic of China (SAC) and the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ) jointly published a notice to approve 259 new China national standards, including several food safety

national standards that were issued for the first time. The new national standards cover the transportation and storage of fruits and vegetables, beverages, ice cream, frozen drinks and other pre-packaged foods. Most of the standards will come into force in the first half of 2015.⁶ It is an important step towards improving the handling and storage of refrigerated foods in China.

Chinese consumers have blind-faith in expiry date

In addition to recommended temperatures for food storage, the survey also studies whether consumers know how to handle and store refrigerated foods properly. The results reveal some misconceptions about food refrigeration and storage among Chinese consumers.

In the survey, consumers were asked whether the following statements are true or false.

| Statement | Answer | Consumers Answered Correctly |
|---|--------|------------------------------|
| After you purchase refrigerated foods from stores, you need to go home and put the foods in a refrigerator as soon as possible to ensure food safety. | True | 95% |
| The expiry dates on packages of perishable fresh goods, refrigerated foods and frozen foods should always be valid regardless of the temperatures foods are kept. | False | 57% |
| Keeping the food at a very low temperature like -10°C can kill bacteria in it and keep food safe. | False | 35% |
| Although ice cream melts during transportation, as long as it is frozen again at the retail store, it is still safe for consumption. | False | 57% |

⁵ [US FDA: Special Handling for Ready-to-Eat, Refrigerated Foods](#)

⁶ [Chemical Inspection & Regulation Service](#)

Ninety-five percent of the consumers know that they should put the refrigerated foods in refrigerators at home as soon as possible after they purchased them from the stores. This indicates that consumers generally understand that refrigeration is essential to keeping foods fresh and safe.

Forty-three percent of the consumers believe that expiry dates were always valid regardless of the temperatures foods were being kept. This is not true in many cases. For example, if you keep frozen meat at room temperature for a few days, it probably will spoil well before the expiry date printed on the package. The blind-faith in an expiry date can cause many potential safety issues.

Nearly two out of three consumers (65%) surveyed believe that low temperature such as -10°C could kill bacteria and keep food safe. Forty-three percent of them thought that melted ice cream was safe for consumption if it was frozen again. In fact, refrigeration only slows down bacterial growth; it doesn't kill most bacteria.

Refrigeration slows down bacteria growth

Bacteria grow rapidly when they have food, moisture, and favorable temperatures. The ideal temperatures for bacterial growth are in the range of 4°C to 60°C . Therefore, food must be kept refrigerated at temperatures below 4°C . Food will gradually spoil if left in the refrigerator for an extended period. Keeping the refrigerator at its recommended temperature will help control the rapid growth of bacteria.⁷

⁷ [West Virginia University: Refrigerator and Freezer Safety](#)

Freezing (under -18°C) slows the movement of molecules, which causes bacteria to enter a dormant stage. However, once food is thawed, the bacteria can resume growth. Unlike cooking (high-temperature), a very low-temperature is used to slow down or stop the growth of bacteria instead of killing most of them. This is why it is important to never refreeze a food item.⁸

For example, if an ice cream is kept at room temperature it will melt. If it stays melted for a long period of time, it is not possible to guarantee that it is still safe for consumption because bacteria will grow while the ice cream is melted.

The government suggests that consumers do not buy any ice cream products which are deformed due to refreezing after melting.⁹ It is also true for frozen meat. Bacteria grow in meat after it is thawed.

In fact, the Chinese government has proposed a national standard which requires frozen meat and fast-frozen food to be kept below -18°C during transportation.¹⁰ This new standard will come into force by the end of 2014.

⁸ Same as above

⁹ [General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China](#)

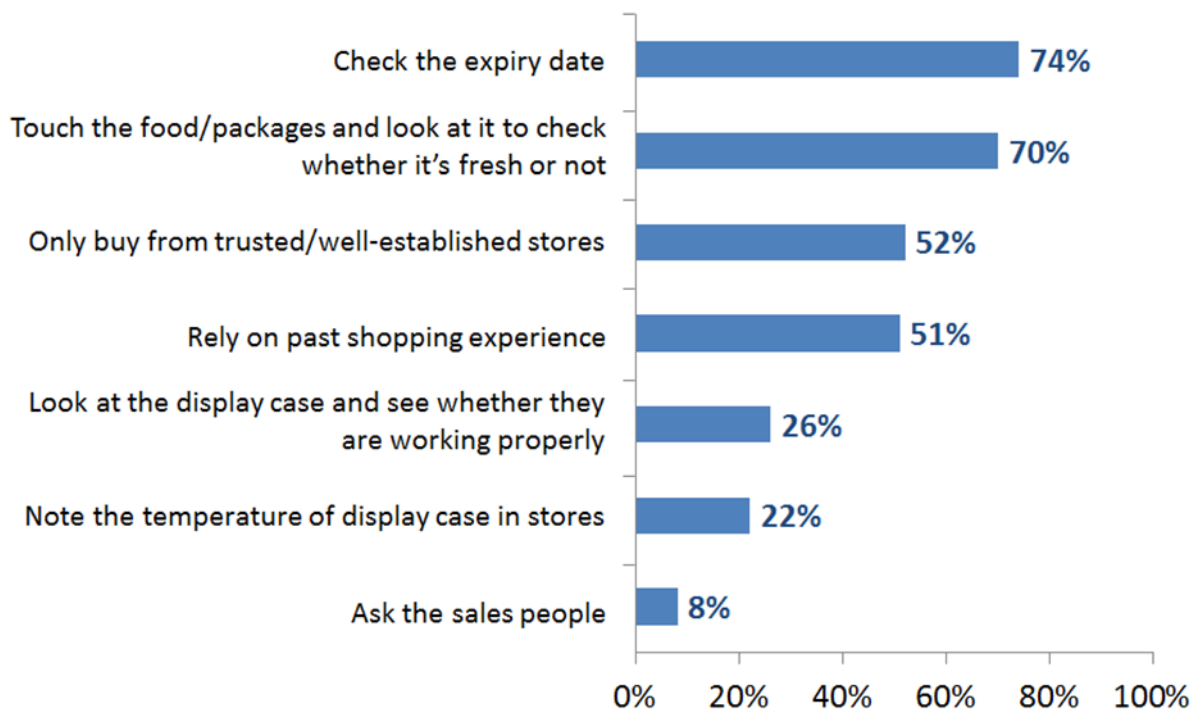
¹⁰ 中华人民共和国国家标准——冷库管理规范

Nearly half of consumers only buy foods from trusted stores

The survey reveals that nearly half (49%) of the Chinese consumers believe that they can determine if the refrigerated foods are well refrigerated in store and during transportation. Seventy-four percent of the consumers check the expiry date and

70% of them touch and look at the foods to check whether it is fresh or not. Fifty-two percent of people only buy foods from trusted and well-established stores.

How consumers judge food freshness and safety

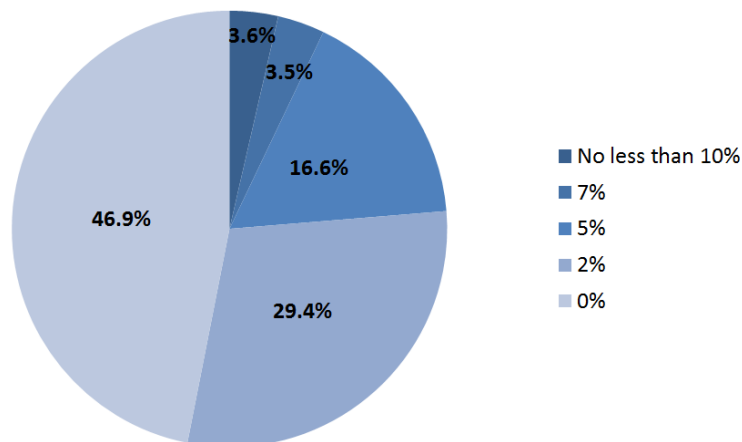


In reality, most of the time, consumers cannot tell whether foods are safe and wholesome, even though they claim that they can by touching them. It is very difficult for consumers to judge whether foods are properly handled or not. They have to rely on suppliers and retailers.

To conclude, more consumer education is needed because most consumers don't possess adequate knowledge to properly handle refrigerated foods.

Consumers expect improved food safety at no additional cost

How much more are consumers willing to pay for better food safety?



The survey discovers that although consumers are concerned about food safety, few of them are willing to pay more to ensure better food quality and safety.

Nearly half (47%) of consumers are not willing to pay more to ensure better food quality and safety. Twenty-nine percent of them are willing to pay 2% or more. Only 24% of consumers are willing to pay 5% or more. This could be due to the cost-conscious nature of Chinese consumers or their belief that suppliers and retailers have a responsibility to ensure food safety without passing the cost to them.

At the same time, consumers put their trust in retailers who demonstrate their willingness and capability to ensure food safety. An overwhelming 91% of consumers trust large supermarkets to handle and store foods properly.

Consumer expectation is especially focused on the big retailers. People expect big retailers to deliver what they promise. Meanwhile,

opportunities also exist for smaller retailers if they can demonstrate the same level of commitment to food safety.

To conclude, shopping for food at supermarkets and convenience stores continues to rise in the surveyed Chinese cities, with food safety concerns being one of the key drivers. This growing market trend provides more opportunities to both large and small supermarkets. Although consumers perceive that large supermarkets are better in handling and storing foods, small retailers are catching up fast in term of improving food safety. They can increase competitiveness if they continue to improve their cold chain infrastructure. However, this study indicates that the costs of improving a cold chain system cannot be easily shifted to consumers. Finding a cost-effective way to improve food safety while minimizing operating costs will be critical for any retailer to succeed in the China market.

Part 2: Supermarket evolution

Consumers are asking for improved food safety in China. They rely on retailers to ensure food quality and safety; however, from the survey, consumers don't expect retailers to shift additional costs to them. Retailers want to ensure quality and safety to meet consumer expectations, but they face the quandary of having to increase prices in order to invest in better equipment and human resources.

However, Emerson Climate Technologies has found a way that works for both retailers and consumers.

Emerson's solution relies on using technology to closely monitor equipment in a store or facility that optimizes the whole food handling and storage process. Adopting the automatic and intelligent technology to operate and support refrigeration systems is critical because the information collection process is automated and can respond quickly to changes.

In many cases, new technologies not only improve the quality of the refrigeration systems to keep foods fresh and safe, but also help reduce operating costs. Retailers that use the latest intelligent store solution to improve food quality and safety can help strengthen their market position and increase sales.

Reducing operating costs is an important incentive for suppliers and retailers to continue investing in more advanced systems. Once a better cold chain system is established, suppliers and retailers are more likely to achieve a higher safety standard. Food retailers are a key segment of the end-to-end cold chain.



Retail stores are the first place where the cold chain interacts with the end-consumer. A retailer case study is featured on page 17 to illustrate how advanced technologies can help retailers achieve the above goals.

Fast-growing supermarket industry in China

From 2008 to 2013, the supermarket industry in China grew at an annual rate of 12% and the revenue reached US\$141.1 billion. Food made up the main product segment at supermarkets.¹¹

However, standards and best practices in handling and storing refrigerated foods are not well defined in China. Many retail stores choose their refrigeration systems based on size (dimensions), volume and deployment costs. Other factors such as energy efficiency and monitoring capability are often secondary or out of the picture.

Many retail stores currently rely on store managers and staff to manually monitor and manage refrigeration systems. They check the thermometers on a regular basis and record the temperatures manually. The lack of a holistic

¹¹ [IBISWorld: Supermarkets in China: Market Research Report](#)

approach creates several food safety and

operational challenges for the retailers.

Food safety challenges

1. There is a lack of real time monitoring, meaning food safety compromises can happen without anyone knowing, especially at night when supermarkets are closed.
2. Manual checks result in human error. For example, forgetting to record the temperature on time, misreading the temperature and recording it incorrectly.
3. Store staff lack technical training. It may take time for them to identify issues. It also takes time to send maintenance workers to fix problems. Food safety may be compromised during that period of time.

Operational challenges

1. It is difficult to gather, save and analyze records. System settings like the output of condensing units cannot be adjusted according to seasons, outside temperatures, number of consumers or other factors. No optimization can be done, resulting in excessive energy consumption.
 2. Inadequate training combined with staff turnover leads to the inability to ensure a consistent quality assurance practice in all stores. They may also create false alarms and waste maintenance resources.
 3. Slow response to an equipment malfunction may increase food spoilage. As a result, food waste and operational costs will increase.
 4. Budget constraints make stores focus on short-term cost benefits and sacrifice long-term efficiency savings and food safety gains.
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Case study: DIA deployed intelligent store solution to improve food safety and save costs

DIA is one of the world's leading discount supermarket chains, founded in Madrid, Spain. It has 7,000 stores in six countries: Spain, Portugal, France, Brazil, Argentina and China. In 2003, DIA opened its first store in China, making the first step in the company's expansion into the Asian market. DIA has around 400 stores in China, with most of them located in Shanghai.

DIA is expanding rapidly in China, opening three to four new stores every month on average. The company is keen to invest in the latest cold chain infrastructure in its new stores while continuously upgrading equipment in existing stores so that food

safety and operational efficiency can be further improved. On average, DIA upgrades its refrigeration infrastructure in five stores every month.

DIA spends about US\$1.5 million each year investing in the latest technology and equipment upgrades in China every year. Emerson Climate Technologies was selected by DIA to deploy advanced intelligent facility management systems in 22 DIA stores in the Shanghai area over the past two years to help the food retailer to improve food safety level and reduce costs.

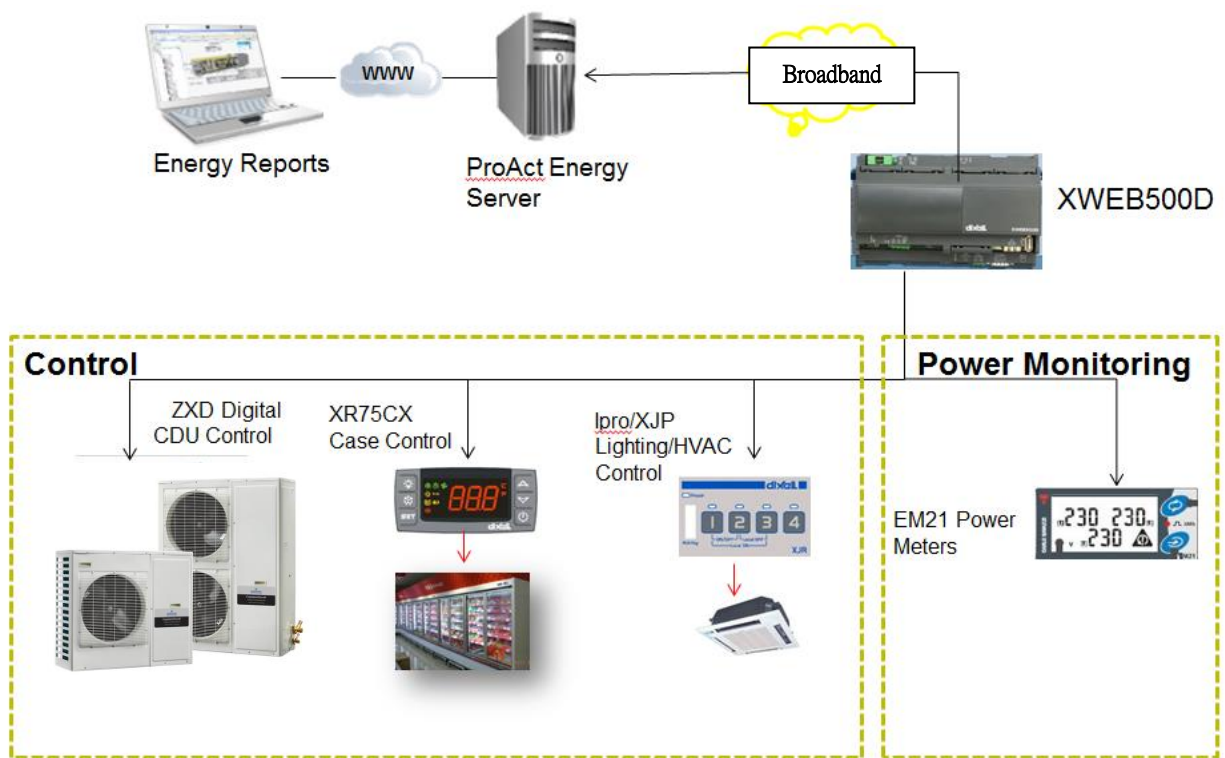
How the intelligent store concept works

The solution provided by Emerson Climate Technologies monitors and controls air-conditioning, lighting and refrigeration systems in supermarkets. The system ensures a timely response to equipment malfunctions caused by the shortcomings of existing systems and practices. It also provides data to the management team to fine-tune systems and increase energy and operational

efficiency of the refrigeration system, as well as other in-store equipment.

The Emerson solutions deployed in each DIA store include a power monitoring system, Copeland Scroll™ Digital condensing unit, store control and an enterprise management system. They work together to monitor and control equipment such as refrigerators, air-conditioning systems, lighting and anti-sweat devices for glass doors.

Power monitoring and control structure



System upgrade includes the following elements

- Emerson upgraded DIA stores' refrigeration systems with the latest Copeland Scroll™ Digital technology to increase energy efficiency. DIA also upgraded lighting with LEDs to further reduce electricity consumption.
- Monitoring and control devices were installed in refrigerators, lighting and air-conditioning systems. The monitoring devices can constantly measure temperatures, and the control devices allow administrators to change system configurations remotely.
- A power monitoring system was installed in each store to measure electricity consumption by different equipment.
- The in-store modem connects all monitoring and control devices to a ProAct Energy Server in a central location through the telecommunications network. Data is transmitted and stored on the server.
- Administrators, at the central location, can remotely monitor and control equipment in each store. They can use the operational data for analysis and program the equipment based on temperature, time, dates and other parameters.



- When a system failure occurs, the system automatically alerts the administrator who can look into the issue by reviewing data remotely. The administrator can fix the problem by adjusting the system configuration or by contacting the store's staff. Alternatively, the administrator can send maintenance workers to the store to fix the problem immediately.

Saving 24% electricity costs; payback period within two years

The solution improves food safety and saves costs in several ways:

- DIA can now check and record operational data in real time. Instead of waiting for staff to check temperature and report back from time to time, the system alerts administrators of system failures in real time. Administrators can quickly respond which ensures food safety and reduces food spoilage costs.
- By automating the monitoring process, the system avoids misreading or any other human error. Administrators can access and control the equipment remotely without relying on store staff and it helps staff make better adjustments. The rate of system failure is high during the summer with 20 system alerts per

day on average. The intelligent system can help identify and solve many issues without sending maintenance workers to stores. This saves on operating costs in the long run.

- DIA can track, store and analyze the store's equipment data. Administrators can program the equipment's operations to ensure food safety in all stores while minimizing electricity costs. For example, the system can adjust the output of refrigeration units depending on the number of shoppers in the daytime. When there is no one shopping at night, it can automatically reduce the system output to save energy. The system can also dim the lighting in the daytime and reduce the output of the air-conditioning system in cooler weather to save energy.
- The upgraded condensing unit using Copeland Scroll™ Digital technology helps save energy by offering greater flexibility by adjusting the system output based on the store's unique needs.
- The highly efficient LED lighting also reduces electricity costs.
- On average, the measures above contributed to 24% energy saving in each store. Half of the savings came from the improved refrigeration systems. A DIA store can easily spend RMB 12,000 on electricity every month during the summer. On average, a DIA store can save RMB 22,000 a year. This is a significant cost savings.
- The deployment time of Emerson's intelligent solutions with Copeland Scroll™

Digital compressor systems ranges from five to seven days. The payback period is within two years.

- An additional benefit is environmental conservation through the reduction in carbon emissions, courtesy of the reduced electricity use.

Moving forward

The deployment of Emerson's solution enhances food safety and reduces operating costs. DIA says it plans to pass the savings to customers. Not only will consumers benefit from the latest technology, but DIA can become more competitive in the market.

To ensure food safety, similar intelligent monitoring and management systems need to be deployed throughout the end-to-end cold chain. DIA has implemented similar monitoring and control systems in its Shanghai warehouse. The company is also testing GPS-based monitoring systems in its refrigerated trucks so that they have full visibility of the cold chain from end to end, ensuring that foods are refrigerated and handled properly throughout the company's distribution network.

Moving forward, all new DIA stores will be equipped with the new intelligent facility management systems provided by Emerson Climate Technologies. The company will continue to upgrade existing stores.

Part 3: Emerson urges more industry collaboration to improve food safety in China

Emerson's survey reveals that Chinese consumers care about food safety, and they expect trusted suppliers and retailers to transport and store refrigerated foods properly to ensure food safety. Many retailers will need to upgrade equipment to meet consumer expectation, but the deployment of new systems involves upfront investments. Passing the costs to consumers is not an option based on the survey's results. Thus, retailers in China find themselves on the horns of a dilemma. The DIA case study illustrates that improved food safety can coexist with lower costs. Using advanced refrigeration compressor technologies, real-time facility monitoring and control systems can improve food safety while reducing costs for retail stores. The DIA case study also illustrates that similar technologies can be deployed throughout the entire distribution network – from warehouses to refrigerated trucks to retail stores. It's a win-win for both the consumers and the retailers.

The cold chain industry, solutions providers and the government should work together to accelerate the industry upgrade to improve food safety. Emerson Climate Technologies recommends the following actions to achieve this goal.

1. The cold chain industry, retailers and the government should provide more education to consumers

The survey reveals that many Chinese consumers do not know how refrigerated foods should be stored and handled. Many of them do not know at what temperatures different refrigerated foods

should be kept. They do not realize that expiry dates are only valid when foods are stored at their recommended temperatures and condition. Many of them hold the misperception that freezing or cooking can kill bacteria.

The consumer is the last mile of the cold chain. It is critical to educate consumers so that they can safeguard themselves. Industry leaders and the government should work together to better educate consumers through educational posters at retail stores, leaflets, TV programs, printed commercials, public seminars, as well as workshops and lessons in schools.

More educated consumers will have higher expectations and appreciate the highest standards of food safety, which will drive retailers to continuously improve their equipment and practice.

2. Promote and facilitate the deployment of best-in-class technologies throughout the cold chain

The industry should promote the adoption of intelligent and energy efficient systems to upgrade the cold chain in China. Food suppliers, logistic companies and retail stores should consider it as a preferred solution to safeguard foods and improve efficiency. They should take a holistic view and consider the total cost of ownership (initial deployment and on-going operational costs) when choosing HVAC, refrigeration, lighting and other equipment.

The automatic intelligent system offers many advantages that cannot be substituted by manual process. The monitoring happens in real-time and can avoid human errors. Administrators can access systems remotely to get better insights into the operations and ensure timely responses in a cost-effective way. All data can be captured and recorded for analysis and compliance purposes. It can also ensure that foods are properly handled during the whole cold chain journey. Most importantly, an intelligent solution can be used to increase efficiency, optimize operations and reduce costs.

By looking at the total cost of ownership with a long-term view, service providers and retailers will realize that an investment in improving food safety is not only beneficial for consumers but also for themselves.

3. Industry players should collaborate to support interoperability and best practices

The industry should share best practices and establish interoperability between systems. The cold chain industry is fragmented and consists of big and small service providers. Food safety is usually compromised at the weakest link. Food

safety can only be ensured when the whole cold chain is up to the same standard. The sharing of best practices will help smaller players understand the benefits of technologies and lower the entry barrier. To provide visibility to the whole cold chain, different monitoring and control systems need to be able to communicate with the central control center. Using one platform to control various devices will reduce complexities and lower deployment cost. It can help increase the adoption of more advanced technologies.

4. Establish improved national standards for the refrigeration industry

The establishment of standards for general practice will help provide detailed guidance to retailers and industry players. It can also become a good educational tool for consumers that can help them better understand how to handle refrigerated foods.

The government should consider establishing national standards on energy efficiency of refrigeration equipment, similar to standards for air-conditioners, to encourage and facilitate the migration to more advanced and efficient technologies.

Conclusion

Proper transportation and storage of fresh and refrigerated foods is critical to ensure food safety. As Chinese consumers embrace modern lifestyle and increase their food purchases from supermarkets and convenience stores, they expect retailers to take the responsibility for proper food handling and storage. This creates both opportunities and challenges for retailers. Leveraging the latest intelligent store technology can help meet consumers' expectation while lowering operating costs. There is also an opportunity for a wider adoption of intelligent monitoring and control technology throughout the cold chain. Emerson Climate Technologies believes that industry players, service providers, retailers, and the government should work together to educate the public and promote the adoption of technology to further improve food safety in China.