

COLD CHAIN LOGISTICS DEVELOPMENT IN FOREIGN TRADE OF THE REPUBLIC OF BELARUS

The article is devoted to the current problem of cold logistics and the growing importance of its role in modern international trade. The author analyzes the main stages of the cold chain, from production to delivery to the final consumer, and emphasizes the importance of maintaining temperature conditions at all stages. The article discusses the benefits of cold logistics for business, including the possibility of exporting goods over long distances and extending shelf life. The importance of the cold chain in ensuring food quality, freshness and safety is also emphasized, as well as the role of the cold chain and directions of its development in Belarus.

Keywords: *cold chain, logistics, international trade, transportation of perishable goods, export*

The issue of maintaining temperature control for products is becoming increasingly significant in logistics, as it directly influences the efficiency of supply chain management and the movement of goods. The primary challenge is ensuring the correct delivery of products over long distances while maintaining quality, meeting customer expectations, and fulfilling the core delivery function. Cold chain logistics has managed to increase its turnover due to the need to accommodate the growth of fresh and quality products, as well as the development of global production. With current market development trends, the requirements for product quality and, in principle, its diversity are significantly increasing, therefore the requirements for technical equipment are increasing, which also increases their transportation costs, the complexity of controlling the supply chain at each stage, increasing the difficulty of maintaining a suitable temperature, as well as increasing the «logistics shoulder» [1].

Cold logistics (also called cold chain) is the process of transporting and storing temperature-sensitive goods and covers the entire supply chain from procurement to packaging, storage, transportation and delivery to the end consumer. Maintaining a stable temperature for goods is a guarantee of quality, freshness and safety. Violation of the temperature regime can lead to product spoilage, reduced shelf life, and, in the case of drugs, loss of effectiveness. Products that require a cold supply chain include: fish, seafood, dairy, meat, frozen foods, wine, beer, juices, vaccines, antibiotics, biologicals, and so on.

Next, let's look at a visual example of an integrated cold supply chain for further analysis, shown in Figure 1.

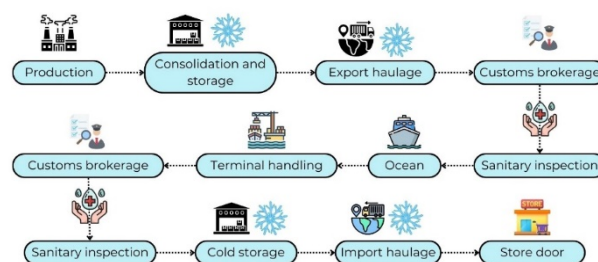


Fig. 1. Integrated cold supply chain

This chain of processes consists of the following stages:

- Producer (produces goods that require special storage conditions, such as refrigerated or frozen foods).
- Consolidation & Storage (products are stored in warehouses in compliance with the required temperature conditions until transportation).
- Export Haulage (goods are transported on specially equipped refrigerators to the place of shipment).
- Customs Brokerage (products undergo customs procedures before being sent abroad).
- Sanitary Inspection (checking goods for compliance with sanitary norms and standards of the destination country).
- Ocean (international transportation by sea is carried out under controlled temperature conditions).
- Terminal Handling (products are unloaded at the port of destination for further clearance and processing).
- Customs Brokerage (products undergo import customs procedures).
- Sanitary Inspection (products are checked to ensure compliance with sanitary standards of the import country).
- Cold Storage (products are temporarily stored in warehouses until transported to the final stage).
- Import Haulage (goods are delivered to their final destinations).
- Store Door (products are delivered to stores where consumers can purchase them).

The difference from the standard supply chain is the strict adherence to temperature conditions at all stages of transportation and storage of products. The normal supply chain does not provide for such special conditions. In this process, the required temperature is maintained, which prevents spoilage of the goods and ensures their freshness, thus, thanks to the ability to maintain product quality during long transportation, companies can export goods to other countries and more distant markets. And also products can be stored longer, which increases the possibilities for their sale and logistics.

There are several areas of use of cold chain logistics: fresh logistics, which provides transportation and storage of fresh products with a limited shelf life (fruits, vegetables); frozen logistics, which ensures transportation and storage of products at temperatures below -18°C (ice cream, meat, fish); pharmaceutical logistics, which provides transportation and storage of drugs that require strict temperature control (vaccines, insulin, biological products); cold logistics for flowers, which provides transportation and storage of flowers that require special conditions to preserve freshness and beauty. The main temperatures for cold chain transport are: "banana" (13°C), "chill" (2°C), "frozen" (-18°C) and "deep frozen" (-29°C) [3].

The Geneva Convention on the International Transport of Perishable Foodstuffs and on Special Vehicles Intended for This Transport (abbreviated as the APR Convention) [4] plays a key role in regulating the international transport of perishable goods. The Asia-Pacific Convention is an important international document that defines basic standards and requirements for the international transport of perishable products. In the Republic of Belarus, adjustments and changes in requirements for the transportation of perishable products and temperature-sensitive products are also constantly being made, which indicates the development of this area in our country [5].

Having analyzed data from Belstat on foreign trade of Belarus [6], shown in Figure 2, we see that exports are beginning to gradually grow.



Fig.2. Foreign trade of Belarus

Let's also pay attention to foreign trade turnover with countries outside the CIS [7], shown in Figure 3, which also demonstrates the promotion of exports among other countries.

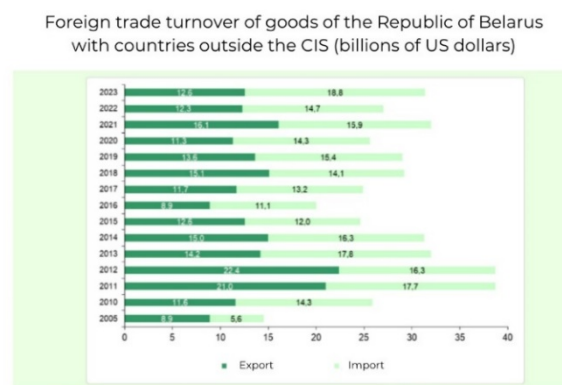


Fig.3. Foreign trade turnover with countries outside the CIS

China is Belarus's largest trading partner in both imports and exports. In 2023, China imported goods from Belarus worth \$2.604 billion [8].

Belarus is seeking to diversify its exports and reduce dependence on traditional markets. China provides new opportunities for Belarusian exporters. Despite Belarus' political situation and sanctions, China continues to support the Belarusian government and economy, which creates a favorable environment for cooperation and trade. China is actively investing in infrastructure projects in Belarus, such as the construction of roads, railways and logistics centers. These projects facilitate trade and transportation of goods between the two countries [9].

According to the data from Figure 4, we see what products China imports from Belarus [8], among which there are products that also require certain temperature conditions.

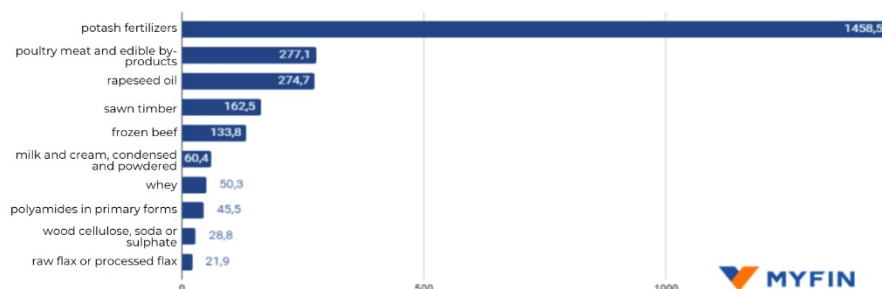


Fig.4. Chinese imports from Belarus in 2023

Belarus is a country located in the center of Europe, but has no access to the sea, which makes it difficult to transport goods over long distances, especially perishable ones. Sanctions imposed against Belarus create additional difficulties for logistics. Many traditional routes have become unavailable and transportation costs have increased. As already mentioned, China has become a key partner in the development of cold storage logistics in Belarus. Chinese investments in infrastructure, as well as a developed cold chain in China, make it possible to deliver Belarusian goods over long distances. Belarus is actively looking for new routes to export its products, including through the CIS countries, the Caucasus, and Asia. Since Belarus is a large producer of dairy products, meat, vegetables, and fruits, cold chain logistics is necessary to ensure the safety of these products during transportation. In this case, the development of cold chain logistics would make it possible to deliver Belarusian goods over longer distances, opening up new opportunities for export [10].

Next, we will consider the directions of development of cold chain logistics in the Republic of Belarus, indicated in Table.

The directions of development of cold chain logistics in the Republic of Belarus

Direction	Description	Examples
Infrastructure development	Construction and modernization of refrigerated warehouses, logistics centers, creation of transport corridors with controlled temperature conditions	Creation of modern refrigerated warehouses with automated control systems, development of transport corridors "East – West" and "North - South"
Investing in technology	Introduction of new technologies for storage and transportation of perishable products, for example, temperature monitoring systems, packaging technologies, use of bio-packaging	The use of GPS monitoring systems for transport temperature conditions, the use of refrigerated containers with improved insulation
Personnel development	Training of specialists in the field of cold chain logistics, training and certification of personnel	Creation of special courses on cold chain logistics in universities and colleges, conducting trainings on product safety and quality
Cooperation with international partners	Attracting foreign investment in the development of cold chain logistics, sharing experience with other countries	Creation of joint ventures with foreign companies in the field of cold chain logistics, participation in international exhibitions and conferences
Creation of a unified management system	Development and implementation of a unified cold chain management system that will combine all stages from production to product delivery	Creation of a centralized platform for monitoring temperature conditions and tracking the movement of goods
Development of the legislative framework	Creation of modern legislation in the field of cold chain logistics that meets international standards	Development of new standards and norms in the field of transportation and storage of perishable products

Direction	Description	Examples
Promotion of Belarusian goods	Creation of a system for promoting Belarusian perishable products in international markets, participation in international exhibitions and conferences	Creation of special programs to promote Belarusian goods in international markets, participation in international exhibitions and conferences

Thus, cold chain logistics plays a significant role in the economic development of the country as the formation of innovative development. The study showed that this area of logistics is necessary for Belarus for the further development and expansion of its own market, however, the relevance of this issue requires additional research, since the implementation of cold chain logistics requires significant investments and investments.

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