

TRANSPORTATION OF PERISHABLE GOODS ON RAILWAYS.

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Abstract: Railway transport is part of the transport system of our country forming the basis and a leading place in the unified transport system occupies. The role of the railway in the power of the state, national economy and defense is important. Transportation of the population and the national economy fully meet all the needs, transportation is high quality and timely performance is required. A little delay in orders for transportation is also the business causes serious damage to the normal operation of the contract economy. This article provides information on the transportation of perishable goods on railways.

Key words: Railway transport, Perishable goods, refrigerator train, autonomous refrigerated wagons (ARV) produced in the GDR, Isothermal moving content.

Food products, which are mainly perishable goods, require compliance with special conditions. Refrigeration technology ensures the integrity of perishable goods. This concept covers methods of obtaining lower temperatures and their practical application for industrial, transport and domestic needs. The development of refrigeration technology and its development is of primary importance in the modern economy. Objects can be artificially cooled below ambient temperature. In this case, first the temperature is lowered, and then it is required to maintain it against external and internal events that try to restore the initial temperature state. In this case, the heat obtained from bodies that are colder than the environment is called cold. Artificial cold is used in various sectors of the national economy for technological processes, product quality improvement, for example, improving working conditions in the storage and transportation of perishable food products, steel processing, fruit freezing, seawater desalination, air exchange (air conditioning), as well as in life, military widely used in technology and scientific research.

The main development history of refrigerated transport. Ice and salt cooling in Russian railway transport began to be used in 1860 (approximately at the same time as abroad) for the purpose of cooling the simplest-designed ice-cars. In 1868, the American Davis refrigeration equipment creates a wall-mounted refrigerator. In 1881, a similar wagon appeared in Russia. The increased volume of transportation of perishable goods has created a new problem of refrigeration. From 1830 to 1861, inventors proposed all the principle schemes of refrigeration machines in use today. As early as 1876, meat was transported on refrigerator ships. In 1877, the first machine-cooled refrigerator was launched in Russia. In 1888, the first air-cooled barge-refrigerator was first used for the purpose of transporting fish. In 1903, a refrigerator train was created in Russia, consisting of six freight cars and a machine compartment car. Railway refrigeration transport is an integral part of railway transport. The reason for isolating cooling transport as a separate network is related to a number of features: when transporting perishable goods, it is necessary to provide conditions equivalent to or similar to the storage of these goods in stationary refrigerators and warehouses. This requires isothermal wagons with cooling and

heating devices; loss of mass (in some cases 2% or more of the net (net) weight) and quality of expensive perishable goods. These losses are directly related to the duration of transportation and other factors. In this case, it is necessary to follow the limit periods of transportation; seasonality of transportation related to the characteristics of food production and preparation; the need to create special conditions related to reducing the impact of adverse factors on perishable cargo during loading and unloading operations.

Preparation for transportation of perishable goods. The main task of transporting perishable products is to ensure that they are not exposed to the harmful effects of physico-chemical and bacteriological factors. The environment in which they are located should also be protected from this effect. Shipping results are affected by: - the quality and condition of the product, its preparation for transportation, its container and packaging; - temperature, humidity of the room where the product is transported, air circulation and exchange there, as well as air cleanliness in the chambers and wagons (absence of germs, mold, gases and odors from the products); - sanitary condition of chambers and wagons, methods of placing products in them and duration (duration) of transportation. Special attention is paid to veterinary-sanitary control. When assessing the quality of food products, its nutritional qualities, harmlessness and virus characteristics are determined. The following are determined by inspection: whether it is possible to allow this product to be transported or stored in a refrigerator, under what conditions, its condition and durability during long-term transportation, the presence of documents confirming its quality, the standard of the product and its container. Chemical and physical properties of perishable goods. Perishable cargo includes cargo that requires protection from high or low temperature and humidity during storage and transportation, that is, special transportation conditions, namely, cooling or heating and air exchange of wagons, special control (care) of the cargo. 98 types of plant and 88 animal products and a large number of preserved products are transported by railways. Organic substances include proteins, carbohydrates, fats, vitamins, acids. Protein is a high molecular substance. The largest group of proteins are enzymes. Today, more than 1,000 of their types are known, each of which is a catalyst for a specific, well-defined chemical reaction. Enzymes cause all biochemical processes in both living and decaying cells. Preservation is associated with slowing down the effect of enzymes in the cell (for example, during sterilization) or increasing their activity (aging). The second group of proteins is involved in the construction of structural elements of cells.

Carbohydrates are formed in the green part of plants from inorganic substances - carbon dioxide and water through photosynthesis. The taste depends on the quantity and quality of carbohydrates. The following are carbohydrates: starch, sugar (glucose, sucrose, fructose), pectin and fiber. Carbohydrates are involved in the formation of cell walls. Pectin substances have the ability to gel, that is, they form a studio and give firmness to unripe fruits. Fats are composed of glycerol and fat cells. The properties of oils depend primarily on the acids they contain. Stearic and palmitic acids make them firm, while oleic acid gives them a fluidity. Fats are a source of energy, and when one gram of fat is acidified, 9.3 kcal of heat is released. For comparison: 1 gram of protein and carbohydrate provides 4.1 kcal of heat. Waxes and essential oils are also fatty substances. Leaves, branches, fruits are covered with wax in a thin layer, protecting them from moisture and damage by microorganisms. Heat capacity is the amount of heat absorbed by the product when it is heated to one degree. It largely depends on the amount of water in the product and the heat capacity of its components. Thermal conductivity is the

intensity of transfer of heat in the mass of the food product. It is necessary to know it in order to determine the duration of the cooling, freezing and thawing processes. Heat gain or enthalpy indicates how much heat is contained in 1 kg of product. The freezing temperature describes the beginning of the freezing process of product juice(s) containing salts. This temperature is called the cryoscopic temperature, which is 0.4 - 4.2 °C lower than the freezing temperature of water.

Basic conditions for storage of perishable goods. All methods of food preservation are based on the following principles: preservation (preservation) of vital processes in living tissue products (freshly picked fruits and vegetables, live fish, eggs, crabs, etc.); weakening of the vital activity of microorganisms and the activity of tissue enzymes under the influence of various physical and chemical factors; stopping the vital activity of microorganisms and the activity of tissue enzymes (pasteurization and sterilization). The following methods of conservation are based on two final principles: physical conservation - drying of products and conservation using high and low temperatures (cold); biological preservation - based on the incompatibility of milk-fermenting and putrefying bacteria, for example, making yogurt, salting cabbage (kvashenie), canning apples, etc.; chemical preservation - based on the addition of nutritional preservatives (salt, sugar, alcohol, vinegar, etc.) to the product, that is, salting, preservation, smoking. The application of one or another method of processing products is associated with changes that can damage their quality. The best method is the one that allows you to preserve the product for the longest time with the least losses while preserving all its taste and nutritional properties. These requirements are met by conservation at a lower temperature (cold), which allows to preserve not only the taste and nutritional properties of products, but also their vitamin content and natural appearance. Causes of nausea of perishable goods Physico-chemical and biological processes take place in food products under the influence of microorganisms and enzymes produced by microorganisms. In addition, the water contained in the products leads to faster passage of chemical and other processes. All this creates favorable conditions for the development of various microorganisms (bacteria, fungi, actinomycetes, yeasts).

Bacteria are single-celled organisms that can be spherical, rod-shaped, or spiral in shape. Bacterial cell consists of protoplasm and shell. Under favorable conditions, bacteria multiply rapidly by simple division, forming a mass (colony) of cells in the product that can be seen with the naked eye. Together, the colonies form a film of slime or other appearance. Molds can be unicellular or multicellular; they develop on the surface of the product and form a fluffy coating. There are gaps inside the product, and mold can develop inside if air is allowed to enter. Popanik fungi produce various enzymes that break down complex organic substances (proteins, fats and carbohydrates) and make them soluble. Most budding fungi degrade food products. Actinomycetes, or light fungi, are similar to bacteria in one way, but in another they resemble a bud. The body of actinomycetes is a filamentous structure that radiates from a central point like rays. The development of many actinomycetes is known by their characteristic earthy smell. Yeasts (yeast) are single-celled, often ovoid or round organisms. Wild yeasts are often round in shape and are found in refrigerated and transported products; they reproduce by pochkovanie. Cultured yeasts are more commonly used in the fermentation industry. Yeast cells are larger than most bacterial cells; they are able to break down sugar into alcohol and carbon dioxide. Control of perishable cargo transportation conditions. Proper handling of perishable cargo must be checked daily. Measures taken in time to eliminate malfunctions of RHT equipment allow to

prevent damage to transported perishable goods. The temperature regime is checked using control measuring devices. Local and remote control methods differ depending on the temperature measurement method. In local control, the temperature is measured at least every 12 hours directly near the car-refrigerator, using a portable metric station, connecting to it the resistance thermometers installed in the car, and in remote control - every 4 hours, from the central control panel of the telemetric station installed in the car-machine compartment of the section. is measured. When transporting bananas and pineapples, local temperature control is carried out every 6 hours. When the temperature is measured in freight cars, the temperature of the outside air is checked at the same time, and thermometers installed on both sides of the service car are designed for this.

Summary: Technical processes of processing perishable goods. Cold processing of perishable products includes chilling, freezing and defrosting (thawing process). When cooling the products to a temperature close to 0 C, the cold becomes a factor that slows down the exchange processes without disturbing the natural chemical balance in the substance, because the speed of chemical reactions is directly proportional to the temperature. During freezing, water separates from the cooled system in the form of ice, and the non-liquid substance becomes inert, i.e. resistant to long-term storage. Ice formation in food products leads to mechanical damage and tissue disruption. In addition, as a result of the release of water, strongly concentrated salt compounds appear, which have a negative effect on the chemical composition of tissues, which causes a change in the quality of food products after freezing.

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