

References:

1. Ковальчук, І. І., Романюк, Н. В. (2020). Тенденції розвитку роздрібної торгівлі в Україні. Економічний простір, (160), 128–134.
2. A.T. Kearney. (2004). Global Retail Development Index. <https://www.atkearney.com>
3. Clarke, I., & Bennison, D. (2002). Retail location planning: can we take the theories of location behavior further? *International Review of Retail, Distribution and Consumer Research*, 12(4), 361–373.
4. Ghosh, A., & McLafferty, S. (1987). *Location Strategies for Retail and Service Firms*. Lexington Books.
5. Colome, R., & Serra, D. (2003). A retail store location model based on the MCI approach. *Annals of Operations Research*, 122(1–4), 135–152.
6. Drezner, T. (2006). Derived attractiveness of shopping malls. *Journal of Retailing and Consumer Services*, 13(3), 205–214.
7. Huff, D. L. (1964). Defining and estimating a trading area. *Journal of Marketing*, 28(3), 34–38.

ANALYSIS OF METHODS FOR ORGANISING OF SMALL-BATCH CARGO DELIVERY

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The current stage of global economic development is characterised by an increase in the complexity of logistical supply chains, heightened competition, and the necessity for rapid responses to changing market needs. Transport logistics is one of the key factors in ensuring business efficiency and competitiveness. A significant number of problems in the organisation of small-batch cargo delivery are due to the high intensity of flows, the need to process a large number of orders, and the complexity of route optimisation. The rapid growth of e-commerce during the COVID-19 pandemic led to an increase in demand for delivery services, particularly for small orders, which often require an individual approach to transportation [1].

At the same time, quarantine restrictions and disruptions to traditional logistical supply chains since the start of military actions on the territory of Ukraine have exacerbated problems associated with the organisation of small-batch cargo delivery, such as increased delivery times, increased transportation costs, and the need to ensure

the safety of delivery participants at the “last mile” stage:

- a large number of delivery points within cities requires complex route planning, which increases time and costs;
- the delivery of small batches of goods as part of consolidated shipments with different transportation conditions complicates the choice of transport;
- the quality of transport services is also significantly affected by problems that may arise at the 'last mile' stage, related to non-compliance with delivery times due to delays, damage to goods, and a lack of transparency in tracking their movement;
- fast and reliable delivery requires logistics companies to implement the latest methods of organisation and optimisation of transport processes, especially in the segment of small-batch cargo, where the number of shipments is large and the size of batches is small;
- the organisation of small-batch cargo delivery often involves the use of a significant number of small and medium-tonnage vehicles within the city, which negatively affects air pollution levels and leads to increased road traffic [2].

The development of information systems and automation technologies creates new opportunities for optimising transport processes. However, the effective implementation of these technologies requires a deep understanding of the specifics of organising small-batch cargo delivery and the adaptation of existing methods to modern conditions. The analysis of small-batch cargo delivery methods, taking into account their specific features in crisis situations and the rapid growth of online trading, is a relevant issue for ensuring the stable functioning of logistics systems and meeting the ever-increasing demands of consumers.

The transportation of goods in small batches has the following characteristics: inefficient use of transport load capacity, significant transportation costs, and high labour intensity in cargo operations [3]. Most often, packaged and piece goods, which include a wide variety of goods transported in packaging and as individual cargo items, are provided for small-batch transportation. Therefore, we propose to analyse the classification of methods for organising the delivery of packaged and piece goods.

Method 1. Packaged and piece goods are transported in boxes placed in the body

of a van. Bodies for such vehicles are mass-produced. Loading and unloading of boxes is carried out manually, which leads to large time costs for vehicle downtime during loading and unloading. This is a significant disadvantage of this method of organising the transportation of packaged and piece goods.

However, the advantage of this method is its versatility. With this method, packaged and piece goods can be delivered to any consumer in any quantity. No special equipment for the recipient or modification of the rolling stock is required.

Method 2. Boxes in the warehouse are placed in containers with special guides and equipped with rollers, which allow the containers to be moved on a flat surface. At the unloading points, the containers are lowered from the vehicle using a lifting platform and moved to warehouses or premises. Empty containers are rolled onto the lifting platform and lifted into the vehicle body.

The advantage of this method of transport organisation is the higher intensity of loading and unloading operations and their lower labour intensity, which reduces downtime during these operations.

The disadvantages of this method are that the vehicle must be equipped with a lifting platform, which reduces part of the nominal load capacity. The use of this method requires a fleet of circulating containers, which require capital investment and repair costs. The use of containers additionally reduces the utilisation of the vehicle's net load capacity and increases the vehicle's load on the return of reusable packaging. The recipient, in turn, needs at least minimal equipment for vehicle unloading areas to ensure a flat floor surface. Additional difficulties arise when operating such container vehicles on distribution routes. When loading empty containers, the driver must perform additional manipulations with the empty containers. They need to be rearranged so that they do not interfere with the unloading of loaded containers. And if, for example, one container is delivered to a point of consumption, the driver will spend more time rearranging them (taking into account lifting the platform) than with the first method. In addition, the operations of lifting and lowering the platform cause excessive fuel consumption, as the platform is driven by the vehicle's engine.

Method 3. Boxes in the warehouse are placed in containers that are not equipped

with rollers. In the warehouse, they are loaded into a converted vehicle body by electric forklifts. At the destination, the packaged and piece goods are unloaded without removing the container from the vehicle, as is done in the first method. The advantages of this method are the high loading speed in the warehouse and the high level of mechanisation of loading. The disadvantages of the described method of transport organisation are the need for a fleet of reusable containers, a fleet of electric forklifts, and vehicle conversion. All this increases capital investment in the organisation of the transport process and its current costs.

Method 4. This method differs from the previous ones in that unloading at the unloading points is carried out using small-scale mechanisation means - forklift trucks or hoists with cargo trolleys. In the first case, the vehicle needs an additional high rear board, and the unloading point needs a loading ramp. In the second case, the presence of a ramp is not mandatory.

Advantages of this method: The process of unloading vehicles is accelerated, and the level of mechanisation of loading and unloading operations is increased, which leads to a reduction in vehicle downtime.

Disadvantages of this method: the same as in the previous one, and in addition, not all destinations have the conditions and equipment for performing the corresponding types of loading and unloading operations. Therefore, this method has limited application.

Method 5. In the warehouse, boxes with packaged and piece goods are placed in mobile containers equipped with rollers. These containers are then rolled into special frame-structured cassettes, up to 8 pieces. Then, the loaded cassettes are placed on roller tracks or on special trolleys into the body of a specially designed vehicle. Unloading loaded containers and loading empty ones is carried out in the same way as described in the second method of transport organisation.

The advantage of this method is the fastest possible loading of loaded and unloading of empty containers in the warehouse and the high speed of unloading in stores. The disadvantages, at the same time, are as follows:

- vehicles with special bodies of non-standard design are required for the

- transportation of packaged and piece goods;
- for loading cassettes (in addition to the cassettes themselves), special premises with large areas, wide and high passages, located next to the warehouse expedition (which is not found in practice), are required. These passages should lead to loading docks equipped with roller tracks or other devices for loading cassettes;
 - due to dimensional limitations and design features, the cassettes do not allow the rearrangement of containers inside the vehicle body, so cargo for one trip can only be delivered to one customer, or a special vehicle must be sent to collect empty containers, resulting in limited application and high capital intensity of the transport process.

Method 6. Differs from the fifth in that stationary containers are loaded into the cassettes, and the unloading of packaged and piece goods is carried out in the same way as in the third method - without removing the containers from the vehicle.

The only advantage of this method is the maximum high loading speed.

The disadvantages of this method of organising the transportation of packaged and piece goods are the same as the previous one, except that transportation can also be organised along distribution routes. Thus, based on the above analysis of methods for organising the transportation of packaged and piece goods, the most acceptable method is Method 1 - goods are transported in boxes placed in the body of a van (loading and unloading is carried out manually), given the high capital intensity of the remaining methods and the current lack of available funds at the enterprise to use methods 2-6 is impractical.

The analysis of existing methods of organising small-batch cargo delivery, the identification of their advantages and disadvantages, as well as the development of recommendations for their improvement, is an important scientific and practical task. The results of such research can be useful for logistics companies, retail enterprises, postal operators, and other participants in the transport services market, contributing to increased efficiency of their activities and meeting the growing needs of consumers.

References

1. Мороз М. М., Шраменко Н. Ю., Мороз О. В., Соларьов О. О. Транспортно-експедиційне обслуговування при перевезенні міських дрібнопартійних вантажів. Вісник Сумського національного аграрного університету. Серія «Механізація та автоматизація виробничих процесів». Вип. 3 (49), 2022. – С. 45-50.

2. J. H. R. van Duin, Vlot, T. S., Tavasszy, L. A., Duinkerken, M. B., B. van Dijk Smart Method for Self-Organization in Last-Mile Parcel Delivery. Transportation Research Record, 2020. 2675(4), 260-270. <https://doi.org/10.1177/0361198120976062>.

3. Гальона І. І. Підвищення енергоефективності перевезень дрібних партій вантажів в рамках життєвого циклу автомобіля : дис. ... канд. техн. наук: 05.22.01. Київ, 2021. 191 с.

IMPROVING LOGISTICS EFFICIENCY IN FREIGHT TRANSPORTATION BY ROAD

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Efficient management of logistics processes is a key factor in the successful operation of modern enterprises, especially in the context of increasing market competition and growing customer service expectations. Rational utilization of transport resources, optimization of delivery routes, and effective inventory management contribute to cost reduction, faster delivery times, and improved overall competitiveness of companies [2, 3, 6]. For this reason, the issue of optimizing logistics processes is becoming increasingly relevant, particularly for enterprises engaged in the transportation of a wide range of goods.

This study examines the operations of a carrier that delivers small consignments of goods via intercity routes. Several shortcomings are identified in the current organizational approach: unreliable suppliers and clients; the absence of modern technologies in transport management and process automation; inadequate warehouse inventory organization; high costs related to fuel, vehicle maintenance, and driver wages; dependence on external factors; insufficient staff training; inefficient route planning; and a lack of customer orientation. Therefore, the aim of this study is to