

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

Bochko O.S., student

Svichynska O.V., PhD in Technical Sciences, Associate Professor

Kharkiv National Automobile and Highway University

Language Adviser: T. Gerasymchuk, PhD, Associate Professor

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

develop solutions for more effective organization of small-batch freight transportation by road.

Additionally, in the process of route optimization, it is crucial to separately consider effective inventory management. This study proposes the combined use of ABC and XYZ analyses [1, 7]. The results of the ABC analysis are presented in Table 1.

Two types of goods—No. 1 and No. 7—fall into category A. Their combined share of total sales amounts to 87.09%. This makes category A the most important group, as these two items alone generate the majority of total revenue. Goods in this category require the highest level of attention in terms of inventory management and demand control. It is advisable to implement strict inventory level monitoring, regular demand tracking, and prioritization in stock replenishment for these items.

Table 1 – Categorization of Items into A, B, and C Groups Based on Sales Share

Item Name	Percentage of Total Sales (Descending Order), %	Cumulative Value, %	Assigned Category
Water Heaters	59,8	59,8	A
Spare Parts	27,2	87,0	A
Mixers	11,5	98,6	B
Components	0,54	99,2	C
Sewerage Products	0,5	99,7	C
Convectors	0,13	99,8	C
Boilers	0,09	99,9	C
Pumping Equipment	0,06	99,9	C
Radiators	0,02	100	C
Towel warmers	0	100	C
Underfloor Heating	0	100	C
Pipeline Valves	0	100	C
Hoses	0	100	C

Item № 9 falls into category B, accounting for 11.58% of total sales. This item occupies an intermediate position in importance between categories A and C. While it

contributes 11.58% to total revenue, it may not require as stringent control as category A items, but still warrants periodic monitoring.

The optimal approach is to ensure flexible delivery schedules and maintain a moderate inventory level to prevent either shortages or overstocking.

Category C includes 10 items (Nos. 2, 3, 4, 5, 6, 8, 10, 11, 12, and 13). Their total sales share amounts to only 1.33%. Items in this category are of lower priority from an inventory management perspective.

For products in category C, it is advisable to minimize stock levels or procure them on a made-to-order basis to avoid excess storage. In some cases, it may be reasonable to reassess the assortment and evaluate the feasibility of continued storage or sales. The results of the XYZ analysis are presented in Table 2.

Table 2 – Classification of Items According to XYZ Analysis

Item Name	Average Value of the Time Series, UAH	Standard Deviation, UAH	Percentage, %	Group
Water Heaters	3375069	214968	6,4	X
Spare Parts	72142	5058	7,0	X
Mixers	10252	764	7,5	X
Components	29144	4757	16,3	Y
Sewerage Products	140	15	10,8	Y
Convectors	16500	1266	7,7	X
Boilers	494561	56026	11,3	Y
Pumping Equipment	332964	33604	10,1	X
Radiators	788221	78754	10,0	X
Towel warmers	2885	316	11,0	Y
Underfloor Heating	75733	9097	12,0	Y
Pipeline Valves	4180	194	4,6	X
Hoses	29472	3223	10,9	Y

The combined matrix based on both types of analysis is presented in Table 3.

Group CX includes spare parts, mixers, convectors, pumping equipment, radiators, and pipeline valves. These products exhibit high demand with medium variability, which indicates generally stable demand with potential seasonal fluctuations. For such items, it is advisable to maintain substantial inventory levels while ensuring timely replenishment without excessive storage costs.

Group CY encompasses products with medium demand and high variability (such as towel warmers, underfloor heating systems, hoses, and sanitary fittings). For these items, it is recommended to minimize stock levels and apply flexible inventory management methods that allow rapid replenishment in response to changing demand.

Table 3 – Combined ABC-XYZ Matrix for the Analyzed Product Range

A	B	C
X - Water Heaters, Spare Parts, Mixers, Convectors, Pumping Equipment, Radiators, Pipeline Valves	Y - Boilers, Sewerage Products, Components, Towel Warmers, Underfloor Heating, Hoses	Z - - -

Group AX includes water heaters — a product with high and stable demand. For such goods, it is advisable to maintain consistently high inventory levels to ensure uninterrupted supply.

Group BY includes boilers, which have medium demand and variability. Flexible inventory management is recommended for these items, taking into account seasonality to avoid both shortages and overstocking.

The construction of the shortest distance matrix using the potential method and the optimization of delivery routes with the Clarke-Wright method [3–5] yielded the results shown in Table 4. Three delivery routes were obtained. The first route remained unchanged, while routes 2 and 3 were modified, which led to improvements in key logistics indicators.

For routes 2 and 3, the route length was significantly reduced (by 23.3% and 27.5%, respectively), which in turn decreased the turnaround time (by 17.4% and 18%).

On route 2, the cargo volume increased from 813 kg to 912 kg, and the load factor improved from 0.78 to 0.84 and from 0.80 to 0.84, respectively. This indicates more efficient utilization of cargo space.

Reducing turnaround time enables the performance of more deliveries within the same time frame.

Table 4 – Comparative Characteristics of Existing and Proposed Routes

Route №.	Distance, km		Turnaround Time, h		β		Cargo Volume, kg	
	Before	After	Before	After	Before	After	Before	After
Route 1	528	528	11,3	11,3	0,58	0,58	1140	1140
Route 2	502	385	10,8	8,92	0,78	0,84	813	912
Route 3	342	248	8,6	7,05	0,8	0,84	1520	1421

Reducing the route length decreases fuel consumption, which positively affects overall costs and enhances the environmental sustainability of transportation. Increasing the load factor reduces the number of empty trips and improves the efficiency of transport utilization.

References

- Warehouse Management: Inventory Analysis Approaches and Best Practices : сайт. URL: <https://lingarogroup.com/blog/warehouse-management-inventory-analysis-approaches-and-best-practices> (дата звернення: 10.11.24)
- Аулін В. В., Голуб Д. В., Біліченко В. В., Замуренко А. С. Формування показників оцінки ефективності транспортного процесу перевезень. Вісник машинобудування та транспорту. Вінниця. 2020. № 1(11). С. 4 – 10.
- Ачкасова Л. М. Оцінка ефективності процесу перевезення вантажів. Економіка транспортного комплексу. Харків. 2014. Вип. 24. С. 117 – 124.
- Логістика: теорія та практика : сайт. URL: https://essuir.sumdu.edu.ua/bitstream-download/123456789/38038/1/Bilovodska_Kuslyi_Olefrenko_Solyanyk.pdf (дата звернення: 10.11.24)
- Методи маршрутизації дрібнопартійних перевезень : сайт. URL:

<https://conferences.vntu.edu.ua/index.php/mn/mn2020/paper/viewFile/8490/7138>

(дата звернення: 10.11.24)

6. Нагорний Є. В., Наумов В. С., Іванченко А. В. Аналіз сучасних підходів до підвищення ефективності логістичних систем доставки вантажів в міжнародному сполученні. Транспортні системи та технології перевезень, Харків. 2012. № (3). С. 68 – 72.

7. Оптимізація товарних запасів як фактор ефективної діяльності торговельного підприємства : сайт. URL: <https://conf.ztu.edu.ua/wp-content/uploads/2018/12/586.pdf> (дата звернення: 30.11.24).

FORMATION OF CRITERIA FOR CHOOSING A RATIONAL TECHNOLOGY FOR DELIVERY OF PERISHABLE CARGO TO EU COUNTRIES

Voloshyna A.O., student

Pavlenko O.V.

Kharkiv National Automobile and Highway University

A rather complex network of global economic interconnections around the world, including in the EU, is in constant dynamics. By reducing irrational financial costs and constantly adapting to the relevant conditions of an unstable external environment, it is possible to fully and efficiently develop the available import and export opportunities in the logistics space. When managing different processes and objects in the logistics system, there may be a certain separation of technological processes of state control services, disconnection of existing technologies of the main elements (ports, terminals, stations). As a result, a single technological process is not used by all participants in the delivery process and unified planning, the quality and degree of interaction with transport companies and cargo owners are insufficient, and the level of effective interaction of the transportation process with the external environment of the system is low [1-4].

The dynamics of the value of exports of cargo to the EU countries for the period