

METHODS OF SELECTION OF TYPES AND ELEMENTS OF TRANSPORT AND LOGISTICS FACILITIES AND MANAGEMENT OF TRANSPORT OPERATIONS

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Abstract: the article presents the results of the analysis of transport management systems. TMS is a management system that makes it possible to optimize the planning and execution of operations. A review of TMS systems on various grounds was carried out. The characteristic of the GIS system is presented. Identified advantages of routing systems. The role of the routing system as part of the supply chain monitoring system is defined.

Keywords: transport management systems, domestic and international systems, advantages and disadvantages, supply chain monitoring.

МЕТОДЫ ВЫБОРА ТИПОВ И ЭЛЕМЕНТОВ ТРАНСПОРТНО-ЛОГИСТИЧЕСКИХ СРЕДСТВ И УПРАВЛЕНИЯ ТРАНСПОРТНЫМИ ОПЕРАЦИЯМИ

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Аннотация: в статье представлены результаты анализа систем управления транспортом (TMS). TMS — это система управления, позволяющая оптимизировать планирование и выполнение операций. Проведен обзор систем TMS по различным признакам. Представлена характеристика ГИС-системы. Выявлены преимущества систем маршрутизации. Определена роль системы маршрутизации как части системы мониторинга цепочки поставок.

Ключевые слова: системы управления транспортом, отечественные и международные системы, преимущества и недостатки, мониторинг цепочки поставок.

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Today, the efficiency of transport and logistics processes largely depends on the quality of their automation. It is possible to fully manage the company's logistics with the help of modern IT solutions, one of which is the transport management system (TMS - Transportation Management System).

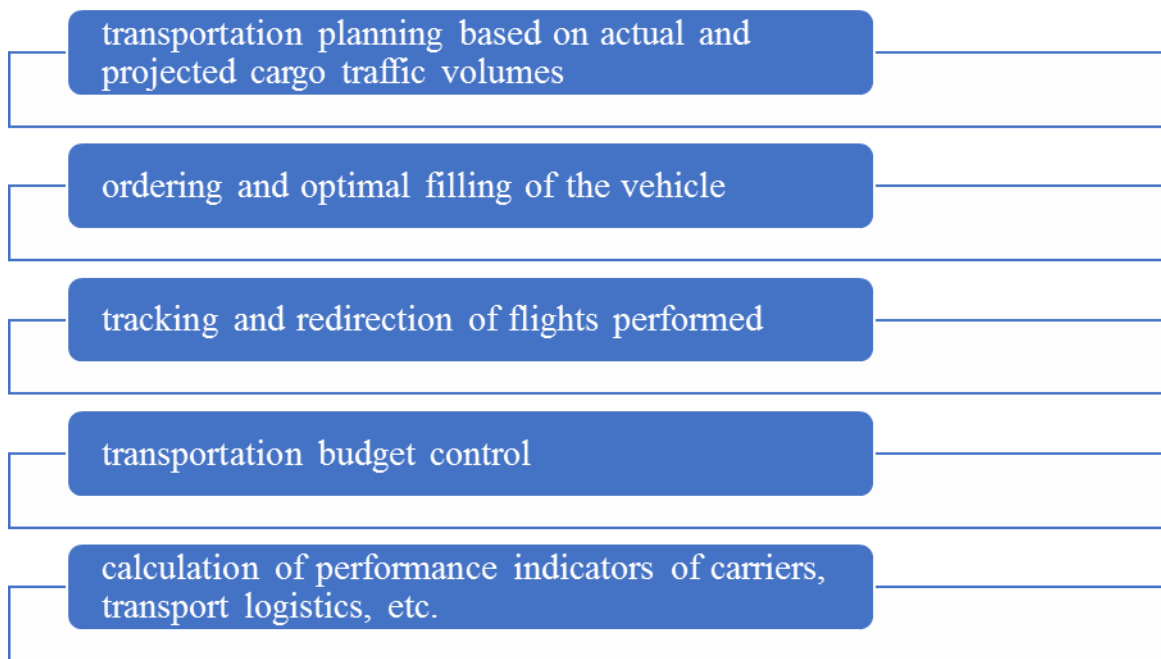


Fig. 1. Capabilities of the transport and logistics process management system

TMS is an automatic transport management system that allows you to avoid mistakes in planning and performing operations under the influence of the human factor. In addition, process automation frees up the time of specialists, which can be directed to solving other, equally important tasks.

Cargo optimization and optimal loading of vehicles, choosing the best carrier offer, the possibility of planning and performing multimodal transportation — all this makes it possible to reduce the costs of logistics operations [1].

TMS is not only a management system, the solution allows you to analyze the data obtained during transportation. Statistics help to understand the reasons for delays, cancellations of delivery or other violations, to improve work and improve efficiency.

It is worth noting that this class of systems is designed for all types of transportation, including sea, air, rail, road transportation with full or partial loading, transportation of individual goods, as well as support for the management of own or engaged fleet.

According to the classification of the foreign consulting company Aberdeen Group [2], the existing TMS class systems on the world market can be conditionally divided into three main groups according to functional characteristics:

1. Internal TMS (Domestic TMS)
2. International TMS (international TMS)
3. Global TMS (Global TMS).

The internal TMS includes functionality for the assessment and routing of transportation, the optimal choice of transportation modes, as well as the carrier suitable for them, the management of delivery requests, support for the main consolidated delivery tasks: a route with N stops, order separation, cargo audit.

International TMS includes in its basic functionality support for the organization of multimodal transportation (auto, air, railway, sea), contract management, distribution management, as well as audit of tariff calculation, execution, cargo. In addition to the basic functionality, the advanced functionality includes tools for optimizing delivery requests, multi-stage and multimodal optimization, as well as estimating the cost of cargo transportation in dynamics.

Global TMS is a program that manages the flow of products, information and funds across borders, including compliance with the inspection procedure, import-export customs clearance, preferential agreements and finance.

It should be noted that the above classification of TMS systems is to a certain extent conditional. In addition to the classification of software products presented above for the creation of transportation management automation systems, such systems as JP (Journey Planners) transport routing systems, VRS (Vehicle Routing & Scheduling), etc. are also represented on the software market [3].

Transport routing systems use GIS — geo-information systems (maps of the road network indicating the average speed, traffic restrictions and other road parameters) to assign the optimal (in terms of minimum distance or minimum delivery time) route of delivery to the customer, determining the zones of delivery in relation to the target level of service [4].

A distinctive feature of this type of systems is the monitoring of transportation at predetermined "control points" of the route in automatic mode, through warnings received by the system from GPS navigators, mobile phones or special sensors mounted in the vehicle. With the help of such systems, it is possible to create cargo delivery plans for the next day and adjust their execution in real time, based on feedback coming from monitoring systems.

The advantages of routing systems include the speed of implementation and low costs for software licensing and implementation, which makes them available even for companies with a small own fleet of trucks. At the same time, it should be remembered that the main costs after the implementation of solutions of this type will be the costs of purchasing from the developer of up-to-date cartographic materials necessary for the functioning of routing systems.

The disadvantages of this type of systems include the inability to automatically plan routes using real-time monitoring; optimization of transportation in the system occurs only according to the criterion of distance or delivery time, without taking into account the costs of it. In addition, transport routing systems can only be used to plan routes in one direction, which makes it impossible to use the same vehicles for reverse loading or "looping", multiple loading and unloading during the route [5].

Transport scheduling systems — VRS-systems — provide automation of transport planners' work by using various built-in optimization algorithms for a wide set of criteria (strategic indicators that are most critical for a particular company), such as:

- optimal vehicle loading;
- minimization of transportation costs;
- reduction of downtime or empty mileage of the vehicle, etc.

Unlike simple routing systems, VRS systems use optimization models in which a centralized traffic flow plan is created immediately from all warehouses along the company's supply chain, a week or a month in advance, and allow you to compare in automatic mode different scenarios of transportation plans obtained using various algorithms. The use of VRS systems makes it possible for planners to create and analyze scenarios of strategic changes in the organization of transportation using built-in graphical and tabular analytics, for example, the impact of replacement or unification of their own transport fleet on strategic indicators.

In addition to GIS data on the road network used by routing systems, optimization models of traffic flows apply very detailed characteristics:

- shipment or delivery schedules (obtained directly from order management systems or production planning systems);
- work schedules of drivers and other personnel engaged in transportation;
- dislocation of vehicles;
- loading characteristics of transport and cargo;
- restrictions on joint transportation or on the loading sequence.

Accounting for transport costs by type of transportation and (or) operators allows you to use VRS systems for planning both your own transport and the need to attract transport from the outside.

The disadvantages of this type of systems include the complexity of operation and configuration, the need for long-term training, a long implementation period (three to four months). In addition, VRS systems are not structurally adapted for joint planning by several transport units (especially geographically distributed ones) [6]. Thus, VRS systems do not allow to control the process of implementing the transport plan and are not able to provide optimal planning for a network transport structure with decentralized management.

Transport routing systems are part of supply chain monitoring systems. In the technical and technological aspect, these systems make it possible, through the use of a set of sensors (sensors), communication, navigation and telecommunications systems, to monitor the essential parameters of logistics processes and the state of the objects of the logistics infrastructure of supply chains, thereby providing the personnel of logistics services and involved departments with up-to-date information.

In general, this makes it possible to achieve the necessary level of quality and reliability of supplies, which are provided, in particular, for the transport process:

- automatic tracking of the movement of goods and transport (GLONASS, GPS, GSM)
- electronic means of generating warnings about danger (for example, when opening a container or attacking the crew with the purpose of stealing a vehicle);
- electronic locks-seals;
- electronic document management in global supply chains, providing advanced information support of operations in the form of electronic messages of a special format (suppliers, recipients, transaction history, vehicle, crew, etc.);
- virtual inspection of containers, vehicles and passengers' luggage, implemented using WAP, RFID and mobile scanners of low-power X-ray radiation, etc.

Modern systems of this type are based on a wide range of information and computer technologies, which are of great importance for the management of logistics operations in supply chains and are one of the main sources of improving the efficiency of decision-making, productivity and competitiveness [7].

In supply chains operating in real time, we need comprehensive monitoring of logistics business processes, i.e. the movement of all resources (material, financial, etc.), implemented by means of integrated information systems with additional tracking and identification technologies. Such monitoring ensures the transition from the technology of control of delivery execution to the technology of operational management of key processes based on information interaction (TBG) of supply chain counterparties [8]. This ensures the necessary level of quality and reliability of supplies due to:

- electronic document management (EDI) technologies;
- automatic tracking of goods and transport flows (for example, GLONASS/WED 5);
- by electronic means of generating warnings about the danger-news;
- electronic locks-seals;
- identification of logistics business process parameters, for example, using barcodes and radio frequency identification (RFID).

Among the means of monitoring the parameters of logistics business processes in supply chains, satellite systems, cellular networks of mobile telephony, the Internet, individual indicators, household appliances, electronic and optical means and identification technologies can be noted.

Technologies for monitoring logistics business processes in supply chains allow us to obtain significant advantages by providing customers with a service with added value. This:

- confirmation of delivery;
- informing on request about the location and condition of the vehicle;
- confirmation of payment for services;
- determining the location of objects (vehicles, containers, pallets, boxes);
- dispatching and navigation (on the route route, at the warehouse, at the terminal);
- reduction of idle vehicle runs, reduction of downtime at border crossings, terminals and ports;
- ensuring the execution of contracts and delivery schedules through adjustments due to logistical risks;
- control over the fulfillment of the requirements for the quality (conditions) of transportation and the performance of loading and unloading operations;
- reducing the time required to perform accounting warehouse and distri-butive operations through the use of portable mobile data collection tools;
- ensuring safety in transport operations by wireless remote monitoring based on intelligent automatic means of identifying the passage of a given route, speed, contents and condition of containers and vehicles.

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