NOVOROSSIYSK SYSTEM OF TRANSPORT FLOWS REGULATION

Mirotin, Leonid B., *Moscow State Automobile and Road Construction State Technical University (MADI), Moscow, Russia.*

Lebedev, Evgeny A., *Kuban State Technological University, Krasnodar, Russia.*

Yamenskov, Alexander I., *Administration of municipality of the city of Novorossiysk, Krasnodar region, Russia.*

ABSTRACT

The authors show characteristics of the transport load on the road network of the port city of Novorossiysk, and the reasons for a long stay of road trains within the boundaries of the municipality. Results of study of traffic flows by type of vehicles, traffic intensity on streets, the nature of interaction with port infrastructure, maritime terminal are given. The authors offer a solution to the problem of congestion of municipal roads through introduction of a notification and permitting traffic control system by a single operator and a block diagram of conceptual algorithm of integration of vehicles into its structure.

Background. *The city of Novorossiysk is the location of the largest commercial sea port in southern Russia. Transshipment of different types of cargo is performed through it. This gateway port is a place where the predominant type of cargo handling operations remains transshipment of cargo from sea routes to land or vice versa, as this port connects the maritime transport network with the infrastructure of land transport.*

Sea, rail and pipeline transport have their autonomous transport networks and system management, that don't have significant impact on environment and livehoods of the city's population. At the same time operations of road transport, particularly of cargo vehicles, are major sources of pollution of the city, discomfort of the population, and social tension.

During recent years volumes of road transprotation have considerably increased, especially regarding containers and exported grain flows [1]. The daily transport load on the city according to the results of the study of incoming transport flows is shown in Pic. 1.

Structural characteristics of incoming traffic flow of freight vehicles are shown in Pic. 2.

The above material shows that considerable share of the transport flow falls on heavy trucks (road trains) delivering goods for their further transportation by sea or carrying imported goods, which came into the port, to the Russian regions.

Objective. *The objective of the authors is to consider now existing problems of road traffic in the city of Novorossiysk and to offer a new system, applied for regulation of transport flows.*

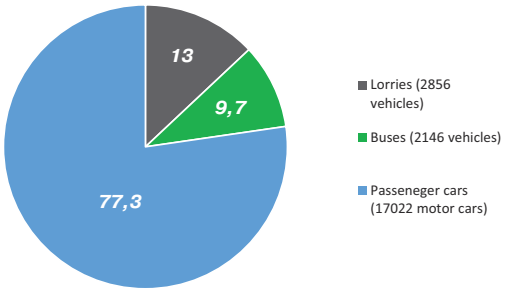
Methods. *The authors use general scientific methods, statistical analysis, graph construction, comparison, economic evaluation.*

Results. *The existing system of port infrastructure work with trucking companies has led to the fact that the average income flow of heavy vehicles is as follows:*

– 90 units per hour – in case of day-and-night operating infrastructure;

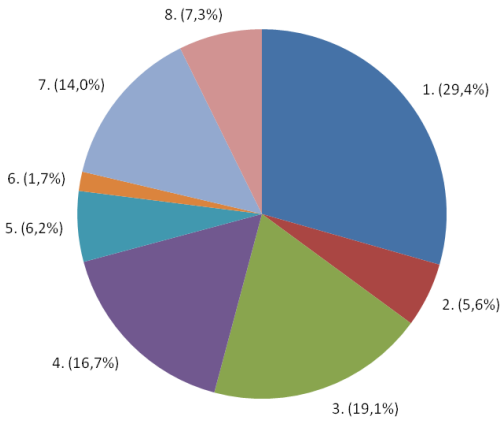
– more than 120 units per hour – in case of 18-hour schedule.

That is, every minute 1–2 freight road trains, each of them is about 20 m long, enter the city of Novorossiysk, creating a 2,5–3,5 km long truck convoy, constantly moving at the speed of 30–35 km/h, with a distance between road trains of about 200–250 meters, and that space is filled by other vehicles. The density of incoming transport flows dramatically increases due to buses and cars, the use of which is quite organized and self-organized: technological down time of route vehicles is provided in places that exclude interference with road traffic,

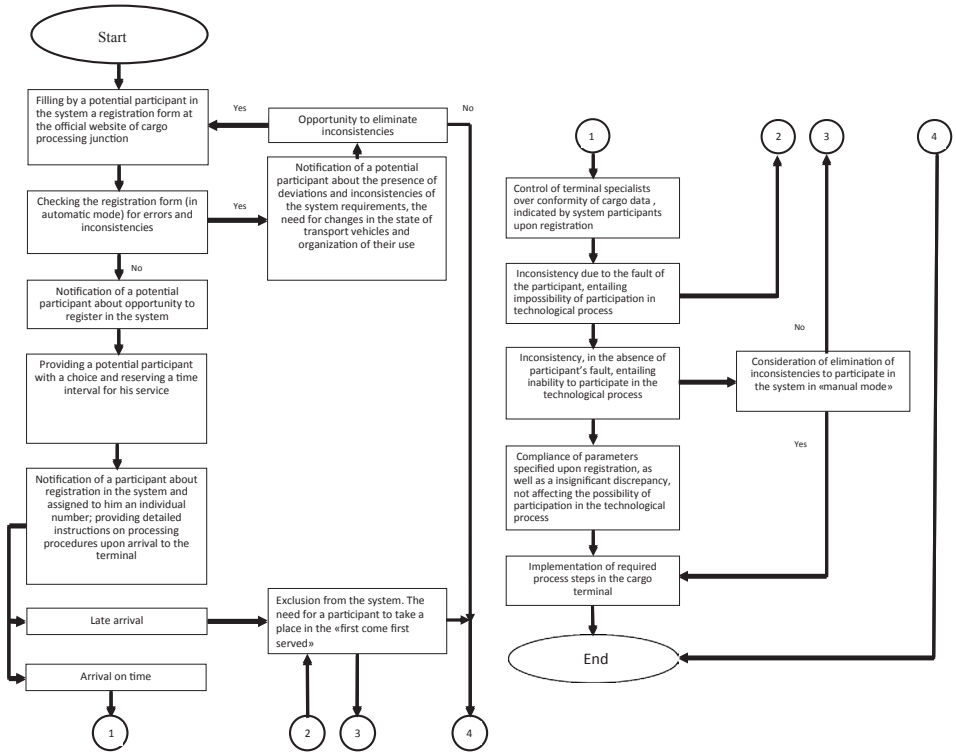


Pic. 1. Characteristics of incoming transport vehicles' flow to Novorossiysk by vehicle types, %.

№№	Type of incoming vehicles	Quantity per day (pcs).	Share in the total flow
1.	Grain carriers	840	29,4%
2.	Road tankers	161	5,6%
3.	Construction transport	546	19,1%
4.	Container ships	476	16,7%
5.	Carts	176	6,2%
6.	Novorosmetal (lorries going to Novorosmetal metal works)	48	1,7%
7.	Refrigerators	400	14,0%
8.	Cement carriers	209	7,3%
	Total number of freight vehicles	2856	



Pic. 2. Shares of vehicles of different types (numbers on the chart correspond to respective lines in the table) in total incoming flow of lorries to Novorossiysk.



Pic. 3. Block diagram of the conceptual algorithm of the process of integration of transport vehicles in the notification-permitting system of work in the transport space of municipality.

and is in line with the technological (route) schedules and passenger cars use city parking facilities.

Freight transport coming to the city for unloading and loading, stays for down time on the roadway of the road network of the city, waiting for the start of upcoming operations. This reduces the carrying capacity of the road network, and leads to destruction of sidewalks and road borders, increases the fumes contamination of the air and accident hazard [1].

The causes of congestion of freight vehicles (road trains) are:

– Technological feature of unloading operations of road trains related to the sampling of cargo (grains) and expectation of results of their analysis to decide on the conditions of acceptance of cargo, unloading or refusal thereof;

– Organization of arrival of specific, technologically necessary and sufficient number of freight vehicles at the appointed time of alleged unloading or loading of a vessel;

– Lack of an integrated transport service management system of stevedoring companies, container terminals, warehouses and transshipment sites, eliminating accumulation of road trains and their long-term presence in the city;

– Expectations regarding transport documentation registration, after loading or unloading of road trains.

The constant presence of queues in the transport service of logistics of Novorossiysk sea terminal shows the absence of system interlinkages with consignors or consignees and those subjects of supply chains of cargo delivery, which are inevitably present in the system, affecting its efficiency. This leads to unreasonable transport load of port areas and road network sections of the city at the entrance to and exit from the municipal territory. The result is organizational and technological need for regulation of sizes and optimization of transport flows.

In addition, continuous development of transport and storage infrastructure and transport complex formed a common system of their autonomous interaction within the urban municipality. Against this background, environmental requirements for transport, and in particular, for road transport, grow, and on the contrary dissatisfaction of environmentalists multiplies.

The combination of all the reasons indicated, in essence, makes inevitable the creation of strategic development guidelines on the basis of electronic notification that is a system of transport flows' reguation based on the system of special entry permissions and operated by a single system operator with fairly spacious suburban parking area by the main entrance and exit from the Novorossiysk boundaries.

The work of a single notification, experts say, makes efficient use of the road network of the city, eliminate unproductive and a long presence on its streets of heavy vehicles, will make it organizationally and economically unprofitable for the car owners.

As a result of the research a conclusion was justified, which should form the basis for innovative form of management:

1. On the territory of the transport area of the municipality there are companies that need transport service of logistics of «their» core business, generating traffic and passenger flows. A large proportion of freight and passenger flows

are served by road mode of transport using the road network of the municipality, responsible for its compliance with technical requirements, road safety and necessary carrying capacity. The municipality is responsible to some extent for sections of federal highways passing through the territory of its transport space.

2. Trucking companies of various organization, legal status, and ownership, and the Russian regions, as well as companies that generate cargo and passenger traffic on the territory of the municipality, use its transport space «at their discretion», and the municipality, being responsible for its condition, does not have any other tool of transport flows' and transport vehicles' control and management besides ordinary system of street and traffic control. Such limited capacity of the municipality does not not meet the format of its responsibility, either interests of all users of the transport environment, namely:

– enterprises generating transport flows;

– trucking companies serving logistics of the municipality enterprises;

– population.

3. Cars of increased load capacity are mainly serves for transportation of consolidated freight shipments equal to tonnage or cargo capacity of road trains.

4. Duration of road trains stay for loading and unloading at the same enterprise has significant deviations for various internal organizational and technological reasons.

5. Street and road network of the municipality serves road trains not only for transportation of shipment, but also when they are coming and leaving, while dealing with organizational and technological issues in different, distant from each other structures of certain consignees or consignors.

6. The current video surveillance system of the municipality allows to have only limited notifying or accompanying information on road traffic regulations and road control system of TV in some parts of the road network.

7. There is a demand of the municipality for formation and organization of work of a unified control system of transport flows and transport vehicles, associated with service of logistics of the enterprises of the municipality transport space [6, 7].

8. Organizational and technological and functional support of a single system requires enhanced interaction of enterprises of the municipality with trucking companies and reduction of unreasonable traffic load on port areas of the road network and federal highways [8].

9. Transport space of the municipality should be considered as strategically important transport hub, imposing certain requirements for the state and equipment of the transport vehicles, that can be integrated in the transport service of logistics of enterprises.

Concept of development of such system, comprising organization algorithms and referring to arriving trucks, and reduced to a block chart, is shown in Pic. 3.

Conclusions. *Development and further implementation of the described system with a single operator are designed primarily to ensure the effective use of the road network of the city and to eliminate unproductive and long stay of heavy vehicles within its boundaries.*

However, the benefits of the proposed system are not limited by described goals, but the very first step depends on the enhancement of municipal regulatory powers. So there is the need to find an acceptable balance in the delimitation of areas of responsibility of local government and users of urban street and road space.

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Information about the authors:

Mirotin, Leonid B. – D.Sc. (Eng.), professor of Moscow State Automobile and Road Construction State Technical University (MADI), Moscow, Russia, mirotin2004@mail.ru.

Lebedev, Evgeny A. – D.Sc. (Eng.), professor of Kuban State Technological University, Krasnodar, Russia, lebedew49@mail.ru.

Yamenskov, Alexander I. – deputy head of Administration of the municipality of the city of Novorossiysk, Krasnodar region, Russia, novoros.zam@mail.ru.

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