

HOW TO LOAD EMPTY CARS' FLOW

Lakhmetkina, Natalia Yu., Moscow State University of Railway Engineering (MIIT), Moscow, Russia.
Galkina, Oksana V., JSC Russian Railways, Moscow, Russia.

ABSTRACT

The topic of increasing the efficiency of empty gondola cars is considered by the authors at the example of the West Siberian Railway. In the process of analyzing the situation, it was revealed that the main problems that have arisen with the multiplicity of owners of rolling stock are a consequence of the lack of a single mechanism for managing cargo flows and are at the interface of interaction with different structures, small and large, federal and local. It is

necessary to build a new management system for empty car flows and regulate this system, in particular the roles of participants in the transportation process, including the operator. The technology of operation of companies-operators with a park of empty open cars, the order of normalization and planning of their approach to coal loading stations of the road are shown. Compliance with such technology allows to significantly increase the level of loading of cars, improve the fulfillment of delivery deadlines.

Keywords: management, railway, empty car flow, operator, cargo owner, plurality of owners, transportation process.

Background. The control system of car flows was formed in its current form in the late 50s of the last century for the conditions of a planned economy with a single owner of cars, managing them as a single impersonal fleet. The share of the company's own cars was then insignificant and did not have a significant impact on the movement of the cars of the Ministry of Railways fleet.

Now, when the industry operates under the conditions of an almost completely private park (95% in a general park), there is a need for a radical revision of the principles of management of car flows, first of all – empty.

Objective. The objective of the authors is to consider ways of loading empty car flows.

Methods. The authors use general scientific and engineering methods, comparative analysis, evaluation method, graph construction.

Results. The main difference in the market behavior of JSC Russian Railways and the independent operator is that they are guided by different optimization criteria. For the first, the most important indicators are still, as in the planned economy, operational ones (although the understanding that such an approach does not correspond to the challenges of time is growing). At the same time, for the operator, the main optimization criterion is the yield on the car in the estimated time.

Under the efficient use of the car, JSC Russian Railways understands primarily a set of traditional performance indicators that do not have a direct connection with the car's profitability per unit of time (although indirectly, of course, these indicators are related to the economy). And for the owners of the rolling stock, in turn, the optimization of some operational indicator does not matter, if this does not affect the profitability of the car [1].

However, in conditions of unstable turnover of the car, the slowdown of which since 2009 has already been more than 9 days, the surplus of the car fleet on the network by more than 250 thousand units, the large number of cars in trains that have been left behind by traffic, the lowering of the profitability for the car requires the construction of such a control system for car flows, at which linkage and dependence of all indicators will lead to general interest of participants of the transportation process in more effective use of rolling stock.

According to many experts, qualitative changes in the market are inevitable. In the study «Railway transport of the Russian Federation. The forecast till 2024» the nature of these changes, terms and results of their approach are analyzed [2]. In the future, mass

write-off of economically inefficient rolling stock with expired service life (more than 100000 cars annually in 2015–2016) and reaching a long-term stable level of 20–30 thousand cars sent to utility waste per year is attended. As a result of the reduction in the rolling stock surplus, the rate of profitability of operations during 2016–2017 will rise to an economically justified level that will allow servicing of cars and restore payments for loans and leasing contracts, and in the long-term perspective for the main types of universal rolling stock prerequisites of the rate growth by 2–4% per year are formed.

At the same time, it should be emphasized that the decommissioned rolling stock will be replaced mainly by economically more efficient innovative cars.

The demand for new freight cars has changed significantly since 2015. The demand for cars with bogie 18-100 and its analogues is low. The cargo owners and operators search for innovative rolling stock that, in terms of its technical and operational characteristics and, most importantly, exceeds its predecessors. Advantages of the new generation cars are greater load capacity, increased body volume, the availability of a tariff discount, increased inter-repair intervals during scheduled repairs, fewer failures during operation and ongoing uncoupling repairs.

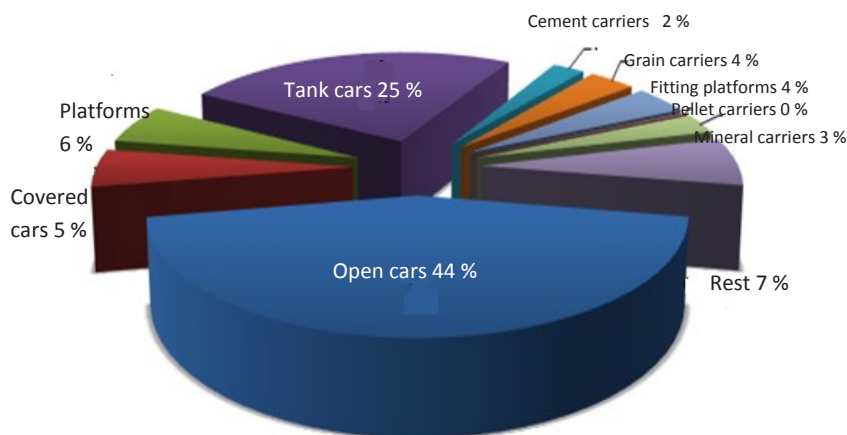
Thus, the next paradigm shift will take place on the Russian railway market: from the park's surplus to the balance with the accelerated replacement of the old fleet (primarily in the segment of open cars and hoppers) with innovative rolling stock [2].

Therefore, it is necessary to seek a balance between the efficiency of the infrastructure, the rhythm and ensuring the public transportation needs.

Significant steps will have to be taken by transport companies in terms of increasing business competitiveness, as well as creating a self-regulating system of operators that would solve such problems as transparency of pricing, healthy market regulation and creation of a comfortable negotiation platform for balanced relations between operators and shippers.

In March 2016, there were 1247 operating companies operating the network, providing cars for transportation of goods. At the same time, in the structure of transportation the first place by the kind of rolling stock is occupied by an open car, in which up to 57% of the total cargo is transported (Pic. 1). At the same time, it should be noted that 50% of the cargo in open car is coal.

According to the ACS MR program, from 2009 to 2015, there was an increase in the loading of coal (primarily due to the growth of export shipments), iron



Pic. 1. Structure of freight car fleet of Russia on 31.03.2016.

ore, chemical and mineral fertilizers. At the same time, there was a decrease in traffic volumes for such cargo as coke, oil and oil products, ferrous metals, construction cargo, chemicals, timber cargo, industrial raw materials and molding materials, as well as non-ferrous metal ores.

Analysis of cargo-generating directions showed that 64% of all coal loading is carried out by the West-Siberian Railway, other regions of Russia noticeably lag behind.

The loading of coal on the West Siberian Railway is carried out by 50 stations and 124 shippers.

The introduction of amendments to the Charter of the Rail Transport of the Russian Federation [3] had a positive impact on the development of the operator services market as:

- it fixed the principle of paying for the occupation of the general use infrastructure by cars outside the transportation process;
- the responsibility of users of railway transport services for ensuring timely removal from the tracks of public and non-public use of empty cars after unloading has been strengthened;
- particularities of the carriage of empty cars are fixed.

As a result, legal conditions were created to improve the efficiency of the use of the railway infrastructure, including its throughput capacity.

The federal law provides a conceptually new approach to the organization of the transportation process on the railway network and, given that the changes in the law relate mainly to the organization of carriage of empty cars, the West Siberian Railway was able to optimize work with the operator companies, increase the rates of loading at stations and reduce losses from the costs associated with the arrival on the road of empty cars.

The number of operators working at each station has been optimized, the rolling stock of companies at individual stations and areas of contiguity is depersonalized.

The ordering of the activities of the universal car parks of the largest operator companies allows to significantly reduce the load on the infrastructure, increase the routing of empty car flows, and on the West Siberian Railway annually increase the loading volumes without significant investments in infrastructure, while reducing losses and risks associated with the delivery of empty cars with expired delivery dates.

So, if in 2014 the average daily fleet of empty open cars on the West Siberian Railway was at the level of

44572 cars (the minimum park was in October – 42800), then in 2015 there is a sharp decrease in their number: in June – 40113, in July – 41412, August – 39683, and in September even lower – 38766). This is 5806 units less than in the fleet of empty open cars in the previous year.

In the changed conditions, the railway, together with the TCFTU, revised the work with shippers and operators. If, in excess of the empty rolling stock, directing it for loading, the railway was guided by the application base of the shippers, but now, with a lack of a park, this is clearly not enough.

Currently, the specified consolidated order is formed by all participants of the process and in this the effectiveness of the management of loading, more rational use of rolling stock, better awareness are seen. The work takes into account all the circumstances: shippers' applications and their technical capabilities, restrictions imposed on loading, the presence of empty open cars on the railway, data of local unloading (responsible station employees have the option, subject to restrictions on unloading, to affect the loading for «themselves» at the planning stage), etc.

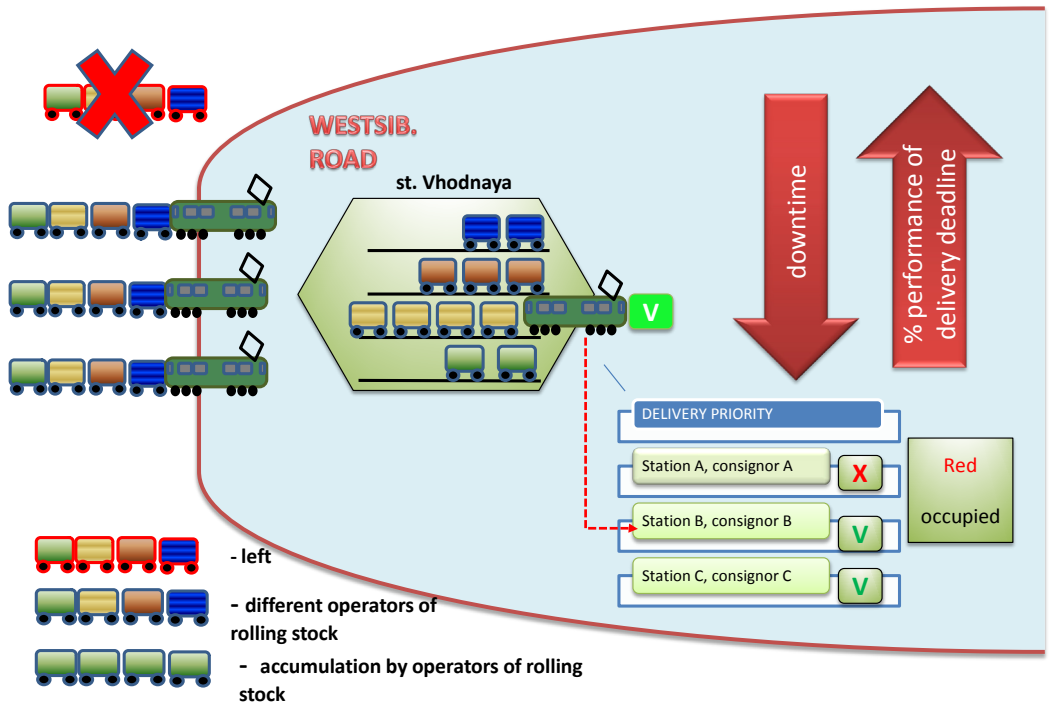
One of the main problems that do not allow to master all the volumes set by the shippers on the West Siberian Railway was the lack of a well-established technology for normalizing the fleet in operation by large operators, mechanisms for encouraging operators and cargo owners to use the rolling stock most effectively. For the operators of car fleet it is often more profitable to «set aside» their cars on the infrastructure, and not to look for ways to load them.

Now, on the railway, the technology of rationing and adjustment of cars wagons when they arrive is introduced. The standards are developed at monthly meetings with the participation of representatives of operator companies, heads of the Directorate for Traffic Management and the Territory Center for Corporate Transport Services.

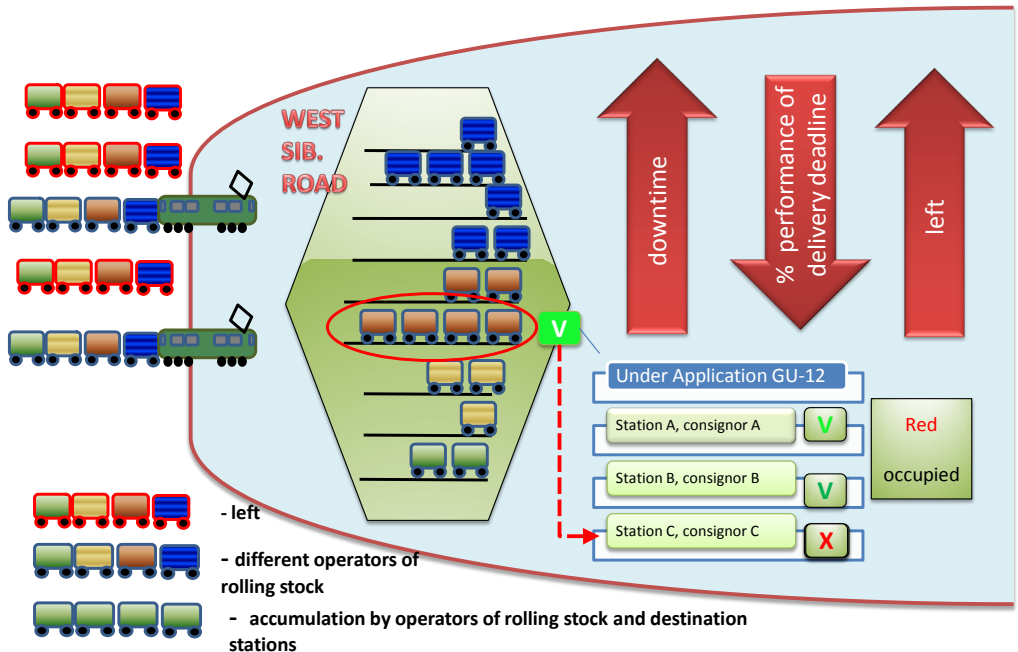
The principles of regulation are based on real practice within the boundaries of the West Siberian railway (the entrance and the park of empty cars, loading and unloading), as well as the parameters of addressing and the required run, taking into account the average daily reception of cars from the CIS countries.

Initial data are the average daily availability of applications for loading (unloading) within the boundaries of the road separately for each operator. At the same time, the empty car park is defined as the product of the total number of applications for the





Pic 2. Scheme of distribution of empty open cars, arriving from the western region, at Kuzbass stations.



Pic 3. Scheme of direction of empty open cars, arriving from the western region at their distribution by stations of Kuzbass.

normative (calculated) turnover of the empty car.

Presence of standards and daily monitoring of their implementation allows to provide an average daily loading for each operator company within the

existing application base, and most importantly – timely to make adjustments to the regulatory measures on the roads of the network.

The obvious result were a gradual decline in 2013

and almost complete exclusion of claims in 2014–2015 for failure to meet the deadlines for delivery of empty cars. In addition, it was possible to collect fees for the temporary deployment of unclaimed rolling stock (stay in transit, without interruption of the contract of transportation).

One of the success factors, of course, is the routing of empty cars for the operators outside the West Siberian road. A special place here is occupied by the Eastern region, since from this direction Kuzbass is not covered by a sorting station.

Over the past few years, a number of empty rolling stock management technologies have been developed that allow to load bulk cargo on the basis of redirection of organized trains, including those formed on the basis of contracts.

As part of these technologies on the Far Eastern, East Siberian, Krasnoyarsk railways, as well as the railways of Yakutia, the provision of mass customers is carried out «nominally» by the West Siberian open car, which became possible due to the signing of an appropriate instruction on redirecting organized trains from empty cars without collecting fees.

Stay en route is one of the colossal reserves for increasing fees, taking into account increased tasks and the current economic situation. And in this case, it became possible due to automation and informatization of processes. The program ASU MR (automated control system for local work) – the KUZBASS menu for monitoring the presence of empty open cars on the railways in the context of the operator companies, normalization and forecast of the delivery of empty car flows for different periods, has been finalized. In real time, everyone can assess the priority of acceleration or deceleration of a particular car flow.

Graphically interactive scheme of runs of empty open cars allows to control the presence of empty cars of large operator companies by appointment to the West-Siberian railway. If there is a decrease by more than 10% of the calculated rate, this indicator will turn red with a minus sign, while on the neighboring roads of this operator company, the figures light up in green, indicating that it is necessary to speed up the progress of its car flow. If the indicator lights up in red with a plus sign, then on approaches it is necessary to slow the progress of these cars.

According to this technology, open cars arriving at the station Vhodnaya of the West-Siberian railway from the western region are distributed after accumulation on the sorting tracks of the station according to operators of rolling stock with subsequent forwarding for loading by priority to the shipper with which the company works (Pic. 2). At the same time, downtime at the sorting station is reduced to a minimum, as well as to the complete exclusion of empty cars (abandoned) by the appointment to the West Siberian railway.

In the case of changing the technology of sending empty open cars to the West Siberian railway in the part of binding to the coordinated applications for specific stations, there will be a disappearance of the car flow of «technological assignments» and, as a consequence, routing at the stations of the network.

The loss of in-road versatility of empty cars will lead to their mass processing at local stations and in the Kuzbass region. The lack of the necessary sorting capacities for the formation of an empty car flow from the Eastern region, the abandonment of the existing technology paralyzes the operational work of the southern region of the Kuzbass and the Eastern region as a whole.

If the principle of rationing of empty cars addressing is denied, it is necessary to take into account a large amount of unloading within the boundaries of the West Siberian Railway, including dual operations, for which it is planned to send an empty car by the time of its delivery.

If the approved technology is abandoned, the distribution of open cars arriving at the station Vhodnaya from the western region will have to be carried out according to a different scheme. Accumulation of cars on the sorting tracks of the station will have to be performed not only by the operator of the rolling stock, but also by the loading stations, the consignor, taking into account the schedule of deliveries, in accordance with the specially developed document, called GU-12 form (Pic.3). At the same time, there is no possibility to send cars to free access roads in priority and will continue to wind up idle times on the ways of the sorting station in anticipation of the release of the loading stations fronts to which cars are intended to be delivered in accordance with the application GU-12 form. As a result, not only idle time at the station Vhodnaya will increase, but the number of empty cars that have been left behind by the traffic and the unavailable delivery times will increase.

Conclusions. The use of address regulation technology that allows for readdressing of empty cars without collecting fees allows to ensure their uniform approach at the loading station, to exclude the presence of empty cars left behind, to reduce idle time at the sorting stations, to increase the level of operational interaction in deciding on the reorientation of the empty rolling stock for loading if it is impossible to accept it at the proposed station, and to reduce, financial losses associated with the violation of the process regularity.

REFERENCES

1. Khusainov, F. I. Reform of the railway industry in Russia: the problems of unfinished liberalization: Monograph [*Reforma zheleznodorozhnoj otrasli v Rossii: problemy nezavershionnoj liberalizacii: Monografija*]. Moscow, Nauka publ., 2015, 272 p.
2. INFOLine on change of paradigm of the railway market: from surplus of car fleet to a balance with accelerated replacement of outdated rolling stock with innovative [*INFOLine o smene paradigmy zheleznodorozhnogo rynka: ot proficita vagonnogo parka k balansu s uskorennyim zameshcheniem ustarevshego podvizhnogo sostava innovacionnym*]. <http://infoline.spb.ru/m/news/102859/>. Last accessed 27.07.2016.
3. Federal Law No. 503-FZ dated December 31, 2014 [*Federal'nyj zakon № 503-FZ ot 31.12.2014*]. ●

Information about the authors:

Lakhmetkina, Natalia Yu. – Ph.D. (Eng.), associate professor of Moscow State University of Railway Transport (MIIT), Moscow, Russia, naturla@mail.ru.

Galkina, Oksana V. – leading engineer of the department of regulation of car fleets parks of the Central Traffic Management Directorate of JSC Russian Railways, Moscow, Russia, odok1@yandex.ru.

Article received 27.07.2016, accepted 29.10.2016.

