

# Increasing Operational Transparency of ‘Russian Railways’ Company

## Systemic Measures to Promote Competitiveness of Rail Freight

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**Abstract**—The increase in transparency of operations and authorization of system freight forwarders with broader powers is a prerequisite for enhancing the competitiveness of Russian Railways. This will increase the degree of versatility of the main facilities of the Russian Railways Company through their use in the activities of the system market players. As a result, fixed costs can be drastically reduced and the activities of the main market participants (including foreign shippers) will be synchronized.

**Keywords**—Russian Railways; monopoly; fixed costs; pime cost; cargo transportation; rights; New Silk Road

### I. INTRODUCTION

‘Russian Railways’ company is a monopolist in the field of rail transport in Russia. The share of rail transport accounts for 18% of the total volume of goods transported in the country. Transit traffic does not exceed 2% of the total cargo volume of the company. This can serve as a clear indicator of the extremely low realization of the transit potential of the Russian network of mainline railways.

The owner of Russian Railways is the Russian Federation represented by the Government of the Russian Federation. It sets tariffs for rail transportation services. In addition, it provides financial assistance to this company to cover for losses on some important routes.

The peculiarities of rail freight include:

- 1) Partitioning of the technological process into extremely simple operations;
- 2) The whole technological process is divided into intervals, equal or many-fold to each other;
- 3) Technological operations are strictly fixed on workplaces, lines and sections;

4) The sequence of individual operations creates the nature of a flow;

5) The railway facilities should be loaded no less than 65–70% to obtain positive returns of the scale and minimum cost of transport services [1]. In this case, the cost of their operation is lower than for alternative means of cargo delivery (road, air transport, etc.). In other words, in order for railway transport to maintain its high efficiency, it is required that the demand for its services be at a stable and high level. For these reasons, this type of transport is insensitive to unpredictable demand spikes and retains its profitability in very limited freight volumes. In addition, its productivity will be the higher, the more time it takes to use the same means of production. From here, there are “numerous cases of extending the service life, changes in running standards and installation of additional equipment not provided for by the original design and technological documentation” [2]. In this regard, the potential change in the technological structure of the railway transport can lead to its unprofitability.

Railway transport has a number of limitations:

1. Limited manoeuvrability in the country due to binding to the road network.
2. The lack of autonomy of individual transport units (trains and cars).
3. Much higher cost of services compared to water transport. For this reason, it can only be used to deliver standard cargo to the back of the continent [3].
4. A high proportion of semi-fixed costs in the cost of freight (according to various estimates, ranging from 68% [4] to 71.7% [5]).

5. Complex trajectories of the movement of information, materials and component parts, which extremely complicate the entire system.

6. A large number of rolling stock versions (diesel locomotives and electric locomotives of various series that have differences in the installed equipment), which greatly complicates its current repair and maintenance.

7. In the production units there are contradictions in the technologies and technical condition of the objects.

Russian Railways seeks to reduce internal chaos by creating production units specialized in certain types of services, work, and parts produced. However, even in this case, an aggregate of poorly related production units is set up, each of which is not interested in the activities of the others. No one is worried about not only the needs of other divisions, but also the needs of users are far away into the background. Each unit seeks to improve its own production facility, not paying attention to the miniscular significance of these improvements. Often, new units are created and designs are developed that have no practical use, and sometimes harm the enterprise in the form of wasted resources.

In order to eliminate congestion at every stage, there are various kinds of “boosters”, namely, line managers, who personally promote urgent cargo transportation and slow down the rest. As a result, the whole system comes to imbalance.

Any production relations of personnel in such production are always arranged hierarchically. Horizontal links between departments and initiatives of common workers are not encouraged and, in fact, are banned.

In the final analysis, today railway transport is close to the limit of its development. Each further performance spurt is given by monstrous efforts and an overstressing of the entire production body of the railway. But even the achieved new frontier is already insufficient, since the market today requires delivering goods several times faster and at the same time serving non-standard cargo flows. Individualization of demand contradicts the nature of rail transport and requires new measures. The attempts to find a solution by restructuring only the control system are unproductive.

In the end, all this significantly increases the costs of Russian Railways and the cost of transportation, reducing its competitiveness.

Nowadays, the company is experiencing increasing competitive pressure from road transport. For example, transportation of goods over distances of up to 2,000 km is almost entirely carried out by trucks because of their mobility and lower costs. Rail transport remains the transportation of raw materials such as coal, oil and petroleum products, sand, gravel, iron ore, as well as ferrous metals. The advantages of this type of transport are high carrying capacity and coverage throughout the country.

## II. COST OF PRODUCTION OF SERVICES OF RAIL TRANSPORT

Russian Railways is experiencing increasing competition from road transport.

Due to the high proportion of fixed costs (fixed costs - FC) in the cost of transportation, railway transport tariffs are insensitive to changes in the demand for cargo transportation. As a result, railway companies cannot quickly adapt to market conditions either in terms of tariffs or carrying capacity. In addition, the benefits of the positive effect of scale can be achieved only in a limited range of freight (from the break-even point to a certain threshold volume of tonnage, after which new investments in fixed assets are required).

The fixed costs in the railway sector include:

- The cost of receiving and dispatching trains at stations
- The maintenance and protection of railway tracks, crossings and artificial structures;
- The cost of removing snow, water and sand from the rails;
- The cost of alarms, communications and electricity;
- The cost of processing shipping documents, etc.

Russian Railways can overcome the negative consequences of a high proportion of semi-fixed costs in the cost of freight (Q), if the volume of services provided will increase. In this case, the average fixed costs per unit of production (average fixed costs - AFC) will decrease (Fig. 1), which makes it possible to reduce transportation tariffs.

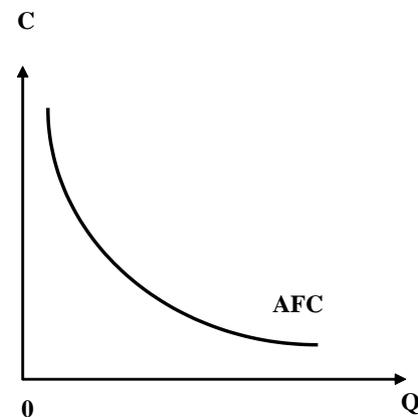


Fig 1. Decrease in average fixed costs with an increase in traffic

Currently, the state sets the Russian Railways tariffs for freight. In this situation, fixed costs are one of the reasons for high tariffs. This is in the interests of this company and therefore does not seek to reduce costs.

Thus, fixed assets of the Russian railway require fixed costs, the value of which does not depend on the volume of freight traffic (semi-fixed costs). As a result, a Path Dependence effect occurs: the activities of Russian Railways are fully determined by investments in fixed assets that have been created over the past 150 years. The standard service life of the railway as an object of capital construction is about 500 years with a renewal period of 18 to 40 years. Such a long term turnover of invested capital deprives the company of the possibility of flexibly changing its production volume.

Russian Railways can only profitably use fixed assets with a high load level. This factor is a barrier to entry into the market, which can be overcome only by very large companies with a high volume of standard freight.

### III. MANAGEMENT OF FIXED COSTS IN LONG-TERM PERIOD

It should be noted that fixed costs remain relatively unchanged only in the short term. In the long run, these costs become variable and therefore the long-term average total costs (longtime average total cost - LATC) may decrease with increasing production (Q). This process is called a positive scale effect (Fig. 2).

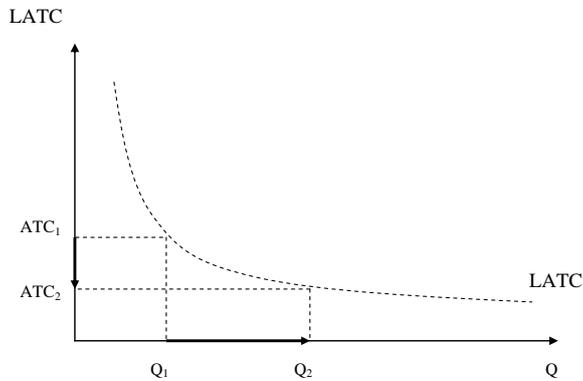


Fig 2. Positive effect of scale production

This means that due to the increase in sales, the turnover period of the invested capital can be reduced, since fixed assets will pay off in a shorter period of time. Consequently, the solution to the problem of the high proportion of fixed costs should be sought in the change in the dynamics of income. This in turn implies the solution of two problems:

1. Increasing the flexibility of Russian Railways cargo volume to market demands. At present, the company's response is delayed, leading to a shortage, then to an excess of wagons and locomotives on the market.

2. Radical reduction of conditionally fixed costs. The experience of American Railways suggests that this is possible. There, the competition mechanism has been successfully implemented not only between the owners of freight cars, but also between individual carriers that own the infrastructure.

From the point of view of the Theory of Inventive Problem Solving, Russian Railways as a system can develop in two directions:

1. Creating subsystems, for example, splitting Russian Railways into independent regional enterprises that will specialize in servicing specific shippers from different regions of the country.

2. Transition to the supersystem. In this direction, Russian Railways may be included in wider transport systems (for example, combining automobile, aviation and other types of transport), integrated into transcontinental systems (for example, in the project "New Silk Road"), included in TNCs as a transport unit and etc.

Consider these areas in more detail.

### IV. CREATING SUBSYSTEMS OF RUSSIAN RAILWAYS

In this area, the authors propose to change the system of rights that participants in the process of cargo transportation by rail have.

Currently, Russian Railways has the rights to own, use and dispose of its property. The monopolistic position of this company in the market and the absence of direct competition enable it to exercise these rights ineffectively.

In our opinion, Russian Railways is a closed structure, the activity of which is not transparent for consignors and the society [6]. This allows this company to save excess production capacity and not control costs. Meanwhile, the position of shippers and the entire economy of a country largely depend on this company; therefore its efficiency is a factor in national security [7].

In this regard, the proposed division of the rights of the company Russian Railways into smaller powers that shipper can purchase for temporary use. Such powers are advisable to provide the main groups of shippers (or their combination), which play a systematic role in this market. This can fundamentally change the functioning of this industry.

The following types of authority can be granted to system shippers in the rail transportation market:

1. Production powers (the right to receive freight services, the right to information about the state of the infrastructure and the locomotives, their renewal and workload).

2. Authorities for servicing the freight (the shipper's right to serve the rolling stock, to train the shipper's employees, to use Russian Railways qualified labor, to provide logistic support, to supply consumables, to consult, etc.).

3. Economic powers (the right to vote when approving the tariff policy, the right to access information on costs and costs, on calculations and profits, on key customers, on the state of the freight transportation market, etc.).

4. Design and technological competencies (the right to determine the development strategy of Russian Railways, the right to information about applied and prospective technologies, the right to participate in the development of development projects).

Part of the specified powers (the right to receive freight services, the right to information about the state of the infrastructure and locomotives) shippers can already buy now [8]. However, some of them who plan to cooperate with Russian Railways for many years and decades are system players in the market are important for the operation of Russian railways and therefore have the right to have an expanded list of rights from the above list.

Thus, such system freight carriers become internal subjects of the Russian Railways company. These powers may concern both the company as a whole, and specific railways that are part of Russian Railways (Moscow Railway, Northern Railway, North Caucasus Railway, etc.). This may lead to the

development of competition between the subsystems of the country's railway communication.

The only shareholder of Russian Railways is the Russian Federation, which eliminates the long-term risks of the program for the sale of an expanded list of powers. The company will receive additional revenues from the transfer of the above powers, which will reduce AFC. In addition, system shippers that have acquired these powers receive a tool to influence fixed costs and freight rates.

The competencies of the highest order (economic and technological design) allow reconsidering the role of individual infrastructure facilities. Some of these objects can be used jointly by Russian Railways and system shippers (carriers): training centers, warehousing facilities, access roads, auxiliary production units, etc. All this can dramatically reduce fixed costs and freight rates.

In the future, the proposed measures may allow Russian Railways to join in the trans-Eurasian transport projects, for example, in the project of the New Silk Road. Increasing the transparency of the internal activities of this company will stimulate the reduction of its variable and fixed costs. Due to this, the tariffs for the transportation of goods from South-East Asia to Europe via the Trans-Siberian Railway may significantly decrease. Increasing the volume of transit cargo can further reduce the cost of transportation due to the positive effect of scale. As a result, both Russian Railways and independent carriers and shippers will benefit.

V. SYNCHRONIZATION OF RUSSIAN RAILWAYS ACTIVITIES AND SYSTEMIC PLAYERS OF THE CARGO TRANSPORTATION MARKET

Due to the above-considered policy of mutual penetration of Russian Railways and the system players of the freight transportation market, their activities will be synchronized, i.e. their periods of lowering and increasing activity will gradually come closer. Currently, the company periodically has periods of excess and shortage of the freight car fleet (up to 20% of the total number of used cars).

If we consider the activity cycles of individual divisions of the company Russian Railways, then we can distinguish two phases in them: the voltage phase (Fn) and the relaxation phase (Fp) (Fig. 3).

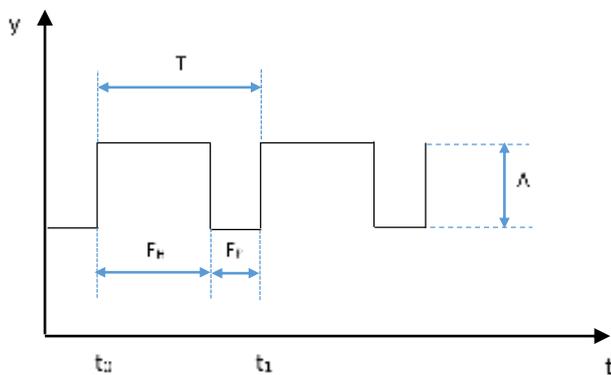


Fig 3. Phases in the cycle of the manufacturing arm of Russian Railways

The cycle period (T) is determined by the formula:

$$T = F_n + F_p \tag{1}$$

Amplitude (A) characterizes the cost of production: the larger it is the more laborious and capital-intensive the cargo transportation process is.

Today, the production division of Russian Railways performs a certain number of cycles per unit of time, which is called the cycle frequency (h). Considering that the cycle duration is taken as 360o or 2π radians, the cycle frequency can be found by the formula:

$$h = 2\pi / T \tag{2}$$

Currently, there is a phase difference in the cycles of the Russian Railways division and system shippers (Fig. 4).

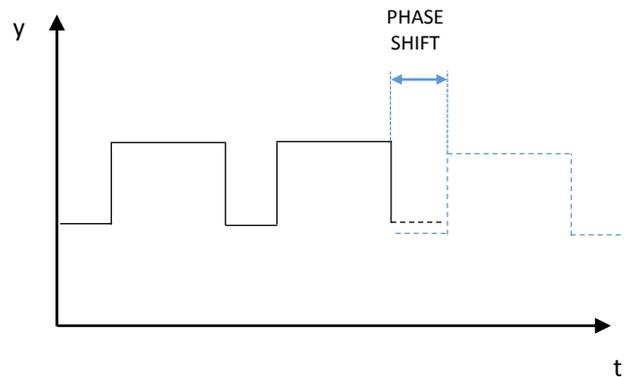


Fig 4. Production cycles of the company Russian Railways and system shipper (phase shift)

With the help of the sale of powers and the subsequent synchronization of their activities, a reduction in the cycle period ( $\Delta T = T - T_H$ ) and a reduction in the cost of production, i.e. amplitudes ( $\Delta A$ ) (Fig. 5).

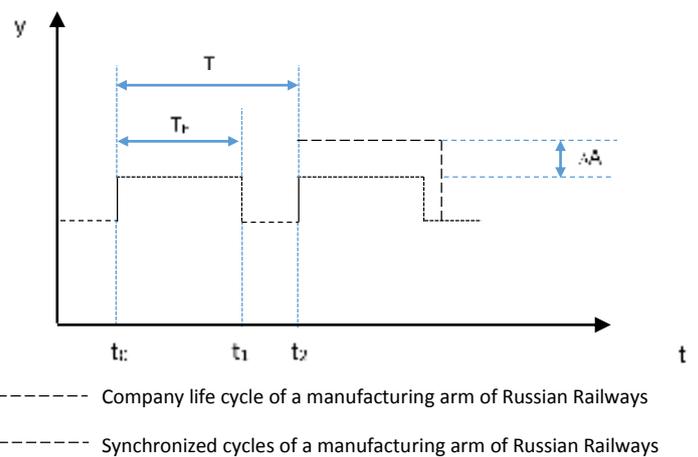


Fig 5. Synchronization of cycles of the manufacturing arm of Russian Railways and a system shipper

Based on Figure 5, the synchronization of the production activities of the Russian Railways Company and system shippers will lead to a reduction in production costs, an increase in traffic volume per unit of time and a cycle frequency.

## VI. WAYS OF CHANGING THE SECTOR OF TRANSPORTATION BY RAIL

The activity of the Russian Railways can be presented in form of four functional levels.

1) production activity, connected with providing services of the railway infrastructure and locomotives.

2) preparatory activity: training the personnel, logistics, delivery of consumable items, electric energy, fuel, and the like.

3) economic activity of the RR which is connected with support of industrial and preparatory types of activity with help of monetary funds flow: receiving income, purchasing goods and material values, labor remuneration, distribution of profit, and the like.

4) project and technological activity which is aimed at building-in the company into the system of commodity circulation in Russia and Eurasia.

At present, for external subjects (cargo shippers, shipping agents, representatives of the government and society) only the first and second levels are made relatively accessible and transparent – the production and the supply-preparatory ones, which allows to receive information about the state of the RR infrastructure, train composition, the level of their charging floor, and others. The other two functional levels are fully closed, which does not allow making confident judgements about the validity of tariffs, efficiency of control over expenditures, necessity of funding on part of the government, and others.

In our opinion, transformations of transportation by rail can be performed if the market of the infrastructure owner will be transformed into a market controlled by the recipient of the goods. From this point of view, the Russian Railways must be maximally included into activities of the consumers of its services – the recipients of the goods.

This presupposes the following rights and duties of the recipients of the goods that correspond to the functional level of the Russian Railways:

1) Production level. The buyer purchases the RR services, that is, its infrastructural facilities and locomotive power.

2) Preparatory level. The purchaser makes investments into the RR objects that allow to perform the production activity of this company, which gives the right to determine the way of using such objects.

3) Economic level. The buyer provides the RR with monetary loans, makes long-term orders, which gives the right to participate in solving the problem of directions of their usage.

4) Project and technological level. The buyer makes investments into the fixed assets of the Russian Railways used for the main production activity of this company (including the projects of prospective development).

The above-noted rights can be converted into specific types of securities, which will enable to resell them to the third parties. This will lead to creating a secondary financial market accompanying and supporting the main production activity of the PJSC “Russian Railways”. As a result, a two-level structure can arise on the market of transportation by rail: a production (transport) sector and a financial sector. Overall, it allows expecting a cardinal improvement of the company’s economic state.

## VII. CONCLUSION

The state of the Russian railways today satisfies neither consignors and government, nor the management of the railway itself [9]. The competitiveness of its freight traffic activity is low, with the exception of transportation of a limited list of bulk cargo. In view of this, systemic measures are required [10]. That will dramatically increase the attractiveness of its services for Russian and foreign shippers. This, in turn, will create prerequisites for the inclusion of the Russian railway in the Eurasian transport projects [11].

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