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## SOME INFLUENTIAL ASPECTS ON THE QUALITY OF RAILWAY BUSINESS OPERATIONS

**Abstract:** *The railway system is a very complex system of operations influenced by many factors. In this paper are given some considerations on the influence factors on improvement of the quality of the railway system operation. Considerations relate to several aspects in order to improve the quality of rail operations. The analysis is concerned with the results of the research on the proposal of measures for improvement of the quality of rail operations.*

**Keywords:** *Railway system, Quality, Business operations, Railway vehicles*

### 1. Introduction

Railways represent companies that reflect all the complexity of operations in terms of scope, complexity of the organization and the complexity of technological segments. The significance and complexity of railroad operations are discussed by mangrove authors from various aspects, such as: the organization of the entire rail business (Sinkevicius et al., 2016), the design of logistics services in the railway sector (Chang et al., 2015), the business environment of the railway sector (Gaidelys, and Dailydka, 2014), the analysis of the railway infrastructure (Stojić et al., 2010), as well as other concepts of managerial principles in the sector of the economy (Nel, 2007; Mishra and Pathak 2012)

In this paper, emphasis is placed on the analysis of some current segments of the Serbian Railways business as a proposal for measures for their improvement. The results of the survey indicate the possibility of improving the overall performance of the company.

### 2. Capacity for maintenance of rolling stock

After the allocation of three joint stock companies from the "Serbian Railways" ad, and at the same time the establishment of new ones, two companies were created regarding the transport of passengers and goods, "Srbija Voz" ad and "Srbija Kargo" ad, which started their work on 10.08. 2015. years. Also, the division and transport capacities and capacities for maintenance of the associated rolling stock were carried out. (depots and workshops). Periodic inspection of towing vehicles in accordance with prescribed procedures is performed in depots and workshops. However, although the criteria for the entry of towing vehicles into regular traffic (at the expense of raising the number of kilometers running, one of the conditions for sending towing vehicles in regular repair), however, are slowly meeting the conditions when the towing vehicles will have to be excluded from traffic and instructions in regular service. The problem is that there are no remounters in Serbia (there is an ad hoc engagement of the removing

machine "Sinvoz" from Zrenjanin to repair 5 sets of 412/416 electric motors from a hundred workers).

There is a choice, whether the towing vehicles are to be sent on a regular basis (overhaul) abroad and pay enormous costs for it or be determined to perform regular repairs in railroads and workshops. Professional potential exists, direct executives ready but without creating conditions, in terms of expansion and equipping capacity, works could not begin. Therefore, the Project for the Expansion and Equipping of Rolling Stock Maintenance Capacity should be developed.

### **3. Revitalization of the leading series of locomotives**

Analyzing the measures to implement the reform of the Serbian Railways in continuity, the option of reform was presented, subject to the previous financial consolidation of the company and modernization of the railway infrastructure and transport capacities. If in this case we base on the state of transport capacity, except for the exceptions concerning the purchase of new diesel-motor and electric motor trains, the situation can be characterized as bad, primarily due to the age of towing vehicles (many work while their lifetime has expired) and their unreliability for operation in rail traffic. Electric locomotives series 441 and 461 and diesel locomotives of the 661 series have come to such a state. The only way to improve their condition is to revitalize them, which would enable reliable functioning in the next 15 to 20 years. For every compliment, the purchase of 8 new multisystem electric locomotives from the EBRD loan for the needs of "Srbija Kargo" ad, with the guarantees of the Government of RS, for use in the trans-European rail network. This problem is somewhat alleviated, but essentially does not solve, due to the need of a large number of locomotives of the leading batch for internal traffic. The

revitalization of the locomotive has never been fully realized due to insufficient financial resources and other priorities. In accordance with the above, it is necessary to develop the Revitalization Project of the leading series of locomotives and to approach it in the next few years.

### **4. Tracking of rolling stock by individual number**

In order to analyze the indicators of the reliability of rolling stock, in particular towing vehicles (immobilisation, number of defects and emergency repairs on 100,000 km), it is necessary to have a reliable and permanent record of the condition of the towing vehicle at any time of the day (24 hours), on the basis of which obtain the necessary data for calculating the above indicators. The traction vehicle traction record, before sending it to the workshop, is determined by the organizational unit of Traction of trains through two forms before sending it to the workshop (Report on the disabling of the towing vehicle and the Record on the determined extent of damage to the towing vehicle). Upon the delivery of the towing vehicle to the workshop, the team of experts of the organizational unit for maintenance of the vehicle's workshop confirms the cause of the defect or determine a new finding, a report is drawn up and an extraordinary repair of a smaller or larger volume is made.

In addition to the miles of traction vehicles, which is managed by the organizational unit of Traction of trains (for each traction vehicle there is data on a monthly basis), it can be analyzed for a certain period (at monthly and annual level), the number of defects per 100,000 km.

A similar procedure is for monitoring the condition and execution of the emergency repair of the towing vehicle in the workshop (request for repair, input document for repair and analysis of failures and daily report on towing vehicles for maintenance in the depot

workshop and waiting for maintenance).

Also, with the available mileage information data, the number of extra services per 100,000 km can be reported.

Due to the complex procedure and frequent lack of coordination between the executors in the process of accelerating the process of getting and repairing towing vehicles in the depot workshop (and actually reducing the percentage of immobilization, the third indicator of the reliability of towing vehicles) and the lack of logging in the record keeping, especially for displaying data for the number of redundant cases per 100,000 km and lack of responsibility, it is necessary to find a comprehensive solution.

With the adoption of instructions by joint stock companies "Srbija Kargo" and "Srbija voz", for the development and management of railway vehicle records, all the conditions for monitoring the condition of each towing vehicle were normatively obtained. The number 413/417 of the electric motor trains (the "Switzerland"), through their GPRS network, their state of exploitation can be monitored at all times or externally, by individual number. By using the software, the data can be adapted to display the reliability indicators in electronic form, which would significantly improve the record of the reliability of the towing vehicles.

The methodology proposed by this paper would consolidate and accelerate all the procedures for determining the daily movement of the towing vehicle by individual number in order to maintain a reliable record of parameters for calculating the reliability of towing vehicles.

## 5. Model of interventional procurement

In Article 39 of the Law on Public Procurement (Law on Public Procurement, Official Gazette of the Republic of Serbia),

public procurement of small value is procurement whose estimated value does not exceed 5,000,000 dinars annually, and the total estimated value of similar purchases on an annual basis not more than 5,000,000 dinars. The members further regulate that the procurement whose value does not exceed 500,000 dinars and if the total value at the annual level of the same purchases does not exceed the value of 5,000,000 dinars, the contracting authorities are not obliged to apply the provisions of the Public Procurement Law, provided that the contracting authority is obliged to prevent the existence conflict of interest, provide competition and the agreed price is not higher than comparable market value.

In terms of public procurement, the Serbian Railways enforce all legal procedures related to the value of less than and much higher than 5,000,000 dinars. However, in practice, there is often a need for urgent purchase of a spare part or material in the value of several thousand or even hundreds of dinars, for quick intervention on a towing vehicle in a periodic inspection or an emergency minor clearance in the workshop for the maintenance of rolling stock (towing and drawn). By removing the defect, the towing vehicle would be available for traffic in a short time and, optionally, it would not increase the percentage of its immobilization. Earlier, there was an "intervention procurement" institution that solved the problem (in the "just in time" principle) in the fastest possible way and prevented the unnecessary retention of the towing vehicle in the inspection or emergency service. The problem was solved by emergency procurement with the simultaneous delivery of spare parts or materials in retail (via profaktura) and the issuance of a certified warrant (payment guarantor) or delivery by the supplier at the prices of the last delivered goods, on the basis of the procurement received on the tender with the issuance of documents, similar to the procedure with retailing. The

option of "intervention procurement" in practice has shown enviable results, the legal basis exists and it is necessary to establish the entire procedure with the Methodology for the implementation of the intervention procurement model, as proposed in the paper.

## 6. Conclusion

In this paper are given consideration of some segments of the Serbian Railways business as well as guidelines for their improvement. The analysis refers to the capacities for maintenance of rolling stock, the revitalization of the leading series of locomotives, the monitoring of rolling stock by individual number, the model of intervention procurement. The presented

considerations in some segments can certainly influence the business of the entire company as well as the basis for improving the organizational structure.

In this regard, a survey was carried out on Serbia's railways in Belgrade in 2018 on a sample of 32 respondents. All proposed measures for improving the business of the Serbian Railways were accepted mostly in the range of 27-32 respondents. It can be concluded that the methodologies guarantee applicability because they incorporate all the prescribed procedures.

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