EFFICIENCY OF USE OF MOTOR-CUV ROLLING STOCK

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Abstract: A system of economic indicators is given that characterizes the effectiveness of the use of multiple unit rolling stock, taking into account its design features.

Key words: transportation, railway, rolling stock, system of indicators, efficiency of use.

Passenger transportation plays an important social and economic role in society. It is they who create the basis for the possibility of exercising the citizens of the Republic of the constitutional right to freedom of movement, providing passengers with transport services.

The most important task of passenger transport is to ensure the high quality of transportation while fully meeting the needs of the population in movement. The required quality of passenger transportation cannot be ensured without the high quality of operational work. At the same time, the task of improving the quality of operational work cannot be considered only from the standpoint of improving transport services for the population. This is a large reserve for increasing the efficiency of all transport production, which makes it possible to save operating costs, free up rolling stock fleets, make the most rational use of human labor, save investments in the development and reconstruction of passenger transport.

At present, the most important business task of the railway is to exit, taking into account the purchase of multiple unit rolling stock of a new modern format. In this regard, the efficiency of using electric trains and diesel trains on the railway, taking into account their intended purpose, is a topical issue that requires a scientifically based approach in terms of the formation of an appropriate system of indicators.

Multi-unit rolling stock (MVPS) refers to motor and non-motor cars, from which electric trains, diesel trains are formed, designed to carry passengers. The design features of the multi-unit rolling stock led to the absence of a locomotive in it, while numerous cars are connected and controlled from one place. Some of the wagons in multiple unit rolling stock have motorized axles; wagons that do not have motorized axles are called trailer wagons.

Multi-unit rolling stock is very popular because:

- easily adapt to the level of demand from passengers (cars can be added and removed from the train);

- there are places for drivers at both ends of the train, so drivers can quickly prepare for the return

- traction and braking forces are distributed along the entire length of the train, resulting in a higher power density per unit weight and more efficient acceleration and braking.

The design features of multiple unit rolling stock (includes both traction and wagon components) and its operation determined the need to form an appropriate system of indicators. At the same time, the formation of a system of indicators should be based on:

- on the study of the existing system of indicators for locomotives, passenger cars and passenger trains (trains);

- modifications of the studied indicators for multiple unit rolling stock.

Solving the problem of substantiating the system of indicators and evaluating the effectiveness of the use of IMPS is based on a phased approach, which is based on the use of applied scientific tools for making the most important management decisions at the macro- and microeconomic levels. The system of indicators should not only give a holistic description of the properties of the object under study, allow assessing the efficiency of the use of production resources, but also develop the main directions for their development.

Studies show that the use of MVPS in the transportation process should be assessed using a system of quantitative and qualitative indicators, which together will determine the criteria for evaluating the effectiveness of their use. All quantitative indicators characterizing the use of MVPS in the general technological process of transportation can be divided into the following groups;

- volume of work performed (in gross ton-kilometers, wagon-kilometers and section-kilometers);

- linear run (train-kilometers, watt-kilometers, sections-kilometers);

- a distance equal to the operating length actually traveled by the train, wagon (section) of the MVPS part of the train section:

- time of use (time spent on the route from departure to arrival at the destination, waiting for work (idle time), shunting work performed by the MVPS on the tracks of the home depot (multi-unit depot) and on the tracks of the station).

An analysis of the quantitative indicators of the use of motor-car rolling stock makes it possible to establish the ongoing changes and assess the emerging trends in their extensive use. It should be noted that the system of quantitative indicators does not allow drawing conclusions about the effectiveness of the work, i.e. intensive use of MVPS. In this regard, the analysis of quantitative indicators is supplemented by an analysis of the qualitative indicators of the use of MVPS, which are classified into the following groups:

- capacity utilization indicators (average train composition - train composition, passenger car occupancy - trains, wagon capacity utilization factor - sections);

- indicators of use in time (turnover of passenger trains, average technical speed of the train, average sectional speed of the train, average daily run of the MVPS, coefficient of technical readiness);

- generalizing indicators (average daily performance of MVPS).

The considered system of indicators makes it possible to study the extensive and intensive use of MVPS, but does not allow evaluating the effectiveness of use. In order to evaluate the effectiveness, it is necessary to determine the efficiency criteria, which can be indicators that allow you to correlate the effects obtained from the operation of the Multi-unit rolling stock with the amount of resources or costs associated with their receipt.

In the proposed system of performance indicators for the use of multi-unit rolling stock, it is necessary to link the technical and economic components of efficiency, based on availability indicators. operation and use of diesel and electric trains in relation to the magnitude of the economic effects of their use (Figure 1). At the same time, a feature of this system of indicators, its formation is the specificity of the operation of multiple unit rolling stock, on the one hand, as a traction rolling stock, and on the other, as passenger cars or passenger trains in general.

The indicators formed on the basis of the technical component make it possible to assess the effectiveness of the use of MVPS only from the point of view of operational work, i.e., in essence, there is no direct assessment of economic efficiency. In this regard, indicators are included in the system of indicators, the calculation of which is based on income and profit from the use of IMPS (as economic effect values).

In indicators determined on the basis of the economic component, direct and indirect indicators are distinguished. The calculation of direct indicators is based on a comparison of the obtained economic effect (income from passenger traffic carried out in the MVPS) and indicators of the extensive use of multiple unit rolling stock. Indirect indicators, in turn, do not directly assess the economic efficiency of the use of IMPS, but based on the dynamics of their change and the correlation of values with other indicators, they allow us to conclude that their trend is positive or negative.

The indicators characterizing the efficiency of the use of multi-unit rolling stock based on operational performance indicators include:

- the average population of the car as part of the MVPS;
- composition turnover;
- average daily mileage of the train;
- the performance of a passenger car as part of the MVPS;
- coefficient of utilization of the capacity of passenger cars as part of the MVPS;
- coefficient of commercial use of MVPS.

The average population of a wagon in the composition of the IMPS shows how many passengers per wagon during transportation. It depends, first of all, on the size of the movement of trains and the size of the passenger flow and shows to what extent the size of the movement of passenger trains, scheduled according to the schedule, corresponds to the actual passenger flow.

The turnover of the train is the total time from the moment of departure of the passenger train for the flight from the home station to the departure for the next flight from this station. The actual value of the turnover is determined by the charts of the executed movement. The rate of turnover of passenger trains is set for each direction and each train when developing train schedules.

The average daily mileage of a train is determined by the turnover of wagons and represents the number of kilometers that a transport unit travels on average per day. The shorter the turnaround time, the higher the average daily wagon mileage

The performance of a passenger car in the MVPS is the average number of passenger-kilometres per passenger car in the operating fleet. The productivity of a wagon is a general indicator of the quality of the use of wagons, since its level depends on the use of wagons in terms of capacity and on the use of wagons over time.

The utilization factor of the capacity of passenger cars in the composition of the IMPS shows the actual use of the offered seats and is defined as the ratio of the number of passengers carried in the car to the total number of seats for passengers. The change in the coefficient of utilization of the capacity of the car directly depends on the change in the average population of the passenger car.

The coefficient of commercial use of the MVPS characterizes the share of time for the commercial use of rolling stock in the amount of the planned fund of time for their possible use, which is a calendar fund, with the exception of the average daily standard of time required to prepare trains of a certain series for a flight, cleaning, equipping, performing all types of technical services repairs. The calculation of this indicator will make it possible to most reliably assess the degree of loading of rolling stock in commercial operation.

Direct indicators characterizing the economic efficiency of the use of multi-unit rolling stock include:

- average daily return on assets of IMPS;
- profitability per car-hour;
- profitability per ton-kilometer gross.

The average daily return on assets of the IMPS characterizes the amount of income from passenger traffic performed by IMPS, per one passenger car as part of IMPS.

The profitability of a wagon-hour is defined as the ratio of income from passenger transportation performed by MVTS to the wagon-hours of operation of passenger cars

as part of MVTS and characterizes the amount of income per one wagon-hour of operation of passenger cars of multiple unit rolling stock.

Indirect indicators of the economic efficiency of the use of multi-unit rolling stock include:

- ratio of the growth rate of income from passenger transportation and the amount of costs for the maintenance and current repair of the MVPS. So, if the growth rate of revenues from passenger transportation outpaces the growth rate of depreciation charges for multiple unit rolling stock, we can say that it is used effectively;

- the ratio of the growth rate of income from passenger traffic and the amount of costs for the maintenance and current repair of the MVPS.

The outstripping growth rate of income from passenger traffic over the growth rate of costs for the maintenance and repair of MVPS indicates their effective use.

The use of the proposed system of indicators in the practice of the railway will allow to assess the efficiency of the use of multiple unit rolling stock both in the complex and for each specific diesel or electric train. This will create a scientifically based basis for making cost-effective decisions on the acquisition (forecasting indicators), use (search for reserves) of modern multiple unit rolling stock on the railway.

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