IN RAIN, HEAT AND COLD THE TRAFFIC SCHEDULE IS NEEDED

REVIEV OF THE BOOK: *Levin, D. Yu. Organization of car flows on railways: Monograph. Moscow, Training and Methodological Center for Education in Railway Transport, 2017, 443 p.*

ABSTRACT

Fundamental work describes the history, current state and prospects for development of organization of car flows, which is regulated by a plan for formation of trains. The tasks of calculating the formation plan of various categories are formulated in great detail. Various modes of the process of accumulation of trains are considered. Market conditions require new criteria, this fact is reflected in the settlement standards. The theory of calculating the formation plan has passed a long way of development, but modern conditions require new methods for calculating the formation plan. At various stages of development of railways, the attitude to the routing of cargo transportation changed. In the conditions of cars' privatization the criteria of routing efficiency have changed. The market conditions left also their mark on various features of organization of empty car flows. The increase in the share of group trains is hampered by the shortage of marshalling tracks. The proposal of the author to introduce the centralized traffic control of organization of car flows is of great interest.

Keywords: organization of car flows, empty car flows, centralized traffic control, car-hours, plan of formation, sender routing, group trains.

The monograph begins with a list of tasks formulated in the Instructive Guidelines for organization of car flows published in different years. With accumulation of practical experience in developing a plan for formation of trains, the number of tasks is constantly growing. Without waiting for the solution of some problems, life gives birth to new ones. The change in social and economic conditions raises new criteria for solving problems. As a result, an important section of railways' operation – organization of car flows is in constant development and search for new solutions to emerging problems.

The accumulation of trains accounts for about 50 % of time of transit cars' stay with processing at technical stations. The conditions of organization, the accumulation process affect the terms of delivery of goods, determine the efficiency of using cars, and when calculating the formation plan – the volume of processing of cars on a hump yard. Therefore, in the monograph a lot of attention is paid to the issues of accumulation of trains. The development of studies of the accumulation process is consecutively reviewed. The obtained results were used in the study of various factors on the indicators of the accumulation process, which made it possible to refine the analytical formulas and more accurately describe the accumulation processes in various modes.

The organization of car flows is affected by a large number of factors. When calculating the plan for formation of trains, this influence is taken into account by means of calculation standards. The system of standards has passed a great way of improvement. Nevertheless, it is rightly asserted that the system of settlement standards requires bringing of existing standards to dependence on the size of the car flows processed at the stations and development of new standards that allow to take into account the processing capacity of the stations and the number of marshalling tracks.

In the calculations of the formation plan, the time of stay of a transit car with processing at the marshalling yards is assumed to be a constant value. Although it is known that with the change in the volume of classification work the time of stay of cars at the station changes. This should be taken into account when evaluating the various options for the train formation plan.

The change in the time of stay of cars at the station with the given and unchanged technical equipment when changing the volume of processing is one of the main factors determining the importance of saving car-hours of all cars processed at the station when the car flow is passed without processing. The greater is the amount of processing, the longer is waiting time for execution of technological operations. This indicates that the determination of the time of stay of cars at the station in isolation from the size of processing is not justified.

To implement an optimal plan for formation of trains at technical stations, a significant number of marshalling tracks lacks. Therefore, when calculating the plan for formation of trains, it is necessary to take into account the availability of marshalling tracks at the stations. Settlement standards have been developed that allow to take into account not only the loading of stations, but also the number of marshalling tracks, when drawing up the train formation plan.

In connection with the loss of relevance of one of the main criteria of the system of organizing car flows – reducing the turnover time of cars, the evaluation of the variants of the train formation plan for the costs of «reduced car-hours» needs to be changed. One of the criteria for assessing the current system of organization of car flows is fulfillment of delivery deadlines. It is possible to use also a monetary estimate as a criterion.

The development of the theory of formation of trains has been traced in great detail, beginning with the first proposals of A. N. Frolov to use the time factor as a criterion in establishing the appointment of trains and I. I. Vasiliev on comparing the costs of car-hours at train formation stations with time savings (in car-hours) from passing of trains without processing through technical stations. I. I. Vasiliev became the author of the methodology of the analytical plan for formation of one-group trains, in which two main provisions were called for the allocation of jets of car flows of the required specialization, called necessary and sufficient conditions. Later I. I. Vasiliev proposed a method of analytical comparisons, which provided for calculations in three stages. At the first stage, the calculation of options for individual stations was carried out, and in the subsequent stages, the calculation of the optimal variant of the plan for the entire considered direction was carried out. But I. I. Vasiliev himself expressed doubts in the guarantee of finding the optimal variant according to the methodology developed by him.

The basic ideas of A. N. Frolov and I. I Vasiliev. were finalized by A. P. Petrov in the form of an absolute calculation method in which the best variant of the train formation plan is determined by minimizing the costs of car-hours on the basis of their direct calculation for all possible options. The method of absolute calculation was

used for directions with a number of marshalling yards no more than five or six.

For decades A. P. Petrov was in charge of scientific research in this field, his method was officially recognized by the Ministry of Railways, he is he author of the fundamental work on the theory of the formation plan, which was the basis for training of engineers of more than one generation.

V. P. Cherenin, who mechanized the calculation for the first time, then developed a program for automated calculation of the plan for formation of trains on Strela and BESM-2 computers for directions from seven to nine stations, offered to reduce a number of options considered.

V. G. Saenko and B. Del Rio developed a methodology for preliminary determination of groups of variants with the same number of assignments, among which is the optimal version of the plan for formation of one-group trains. The remaining groups of options are excluded from consideration.

K. A. Bernhard explored the possibilities of reducing and unifying computations while finding the optimal version of the technical routing plan. This allowed him to develop a method of combined analytical comparisons of the calculation plan for formation of one-group trains. The method of combined analytical comparisons is based on the sequential selection of the most advantageous and elimination of impractical appointments according to the criterion of reduced car-hours.

In November 1958, VNIIZhT received Ural-1 computer, the first on the railway transport. The first task, which was solved on a computer, is calculation of the plan for formation of three stations by the method of absolute calculation (the author of the program is G. A. Kutukova). The use of computers for calculating the plan for formation of trains began. In the late 1960s, S. V. Duvalan for automated calculation of the plan for formation of one-group trains developed a method for sequential improvement of the plan. The methodology allowed to perform calculations for the entire railway network, to obtain the optimal and optimally implemented version of the train formation plan, which took into account the deviations of the car flows from the shortest path along the circumferences, restrictions on the number of tracks and processing capacity of marshalling yards.

With the use of the Duvalan's program at MCC of the Ministry of Railways, a network plan for formation of one-group trains was developed every year since 1970, first for 84 (on the Ural-14D computer), then for 170 (on the ES computer), and from 1982 to 1993 for 285 technical stations.

Targeted work in the field of sender routing has made it possible, especially in the 1960s–1970s, to achieve impressive results in this area. During this period, new large coal deposits (Ekibastuz, Kuznetsk and Kansk-Achinsk basins) and oil (Bashkiria, Western Siberia) were developed, and advanced methods were used to increase the level of routing. The level of sender routing in the total shipment of loaded cars reached almost 50 %.

After 1991, the volume of rail transportation decreased substantially, attention was lessened to the routing of cargo transportation and, accordingly, the level of coverage of loading by routes.

At present, the organization of sender routes allows the removal of processing of about 100 000 cars per day. The result is constrained by the contradictions between the interests of shippers and railways.

After privatization of the car fleet, the routing of cargo transportation was hampered by the lack of systems to ensure loading of empty cars, planning, stimulating and controlling the routing of cargo transportation.

Estimating the efficiency of routing cargo transportation by exceeding the savings en transit, compared with additional costs for organization of routes at the loading and unloading station at the destination station, also lost relevance. It became more important to evaluate the effectiveness of routing:

– for JSC Russian Railways by reducing processing at technical stations (increase in the transit of car flows) while observing the normative period for delivery of goods;

– for operators (cargo owners) by reducing freight charges and accelerating the delivery of goods and turnover of rolling stock.

Features of formation, movement and use of empty car flows streams in the monograph are widely represented by the additional calculation standards developed by the author, allowing to take into account the specifics of working with empty cars.

The privatization of the car fleet has made significant adjustments to organization of empty car flows. Like loaded cars, empty cars began to follow with the complete cargo documents. The centralized regulation of empty cars is almost eliminated. The accents have shifted in responsibility for ensuring the loading plan for empty cars. These changes have not yet been reflected in the theory of organization of empty car flows.

One of the most effective forms of car flow organization are group trains, but the increase in their number on the railways is constrained by the inability of the stations to form them and exchange groups of cars en route. The description of the domestic and foreign experience of the car selection is of interest. The book discusses technical and economic calculations of the interaction of one-group and group trains in organization of car flows. For a wider distribution of group trains, it is necessary to eliminate the shortage of tracks at stations, to create parks of local work at the marshalling yards and to partition a part of the marshalling tracks.

The section on centralized traffic control of car flows is of interest. The development of a plan for formation of trains for a long period with a wide range of fluctuations in the size of car flows periodically leads to inefficiency of the adopted formation plan. The situation is often exacerbated by the cumbersome and slow modern procedure of adjusting the plan for the formation of trains and, indeed, it cannot be called operational. The centralized traffic control allows to react promptly to changes in the calculation standards and values of car flows, increase or decrease in the technical capacity of infrastructure and rolling stock facilities and devices, temporary difficulties in operating work. But for the practical use of centralized traffic control of car flows, it is still necessary to classify all the tasks that arise and to automate the collection and transfer of information, the decision making and bringing it to the performers.

The changed operating conditions of railways urgently require the introduction of adjustments to traditional methods of planning. It is necessary to ensure reliable and complete information support of the plans. The detailed transportation plans do not allow us to identify freight flows that flow through specific marshalling yards. To obtain the size of the transfer at the division points, their «standards» are developed, in which the loading and unloading of all stations is accounted for by these points. Under such a system, a large amount of information generated in the definition of «standards» for calculation of planned car flows for compilation of a network plan for formation of trains and norms for the transfer of cars to division points contains significant errors.

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