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УДК 656.212

FORMATION OF A NETWORK MODEL OF RAILWAY STATION FUNCTIONING

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The efficiency of freight transportation by rail largely depends on the rational organization of the stations. Recently, there has been a tendency to increase the length of downtime of local wagons at the station. This is to a greater extent connected with waiting for the wagons to perform technological operations, i.e. the presence of interoperational downtime [1]. The optimal technology of the railway station should ensure the lowest operating costs, high labor productivity, acceleration of cargo processing by reducing car downtime [2].

The most convenient way of visual representation of all technological processes taking place at the station are network models, namely network graphs. A network graph is a dynamic model that allows you to present a technological process in graphic form, to clearly display the sequence and logical relationship of individual operations that make up this process. The following elements form the basis of the proposed network schedule, built taking into account the operations that are included in the total time of carriages on the station tracks [3], processing of information and documents:

- event – the fact of the end of one or more operations, which is necessary and sufficient for the possibility of starting one or more other operations. Thus, the delivery of wagons to the cargo front cannot be started until the coordination of the delivery with the shunting dispatcher, the transmission of the message about the delivery of wagons is carried out;
- work – a completed action or a series of interconnected actions aimed at solving a specific task (supplying wagons to the freight front, etc.);
- waiting – a process that only requires time (waiting for wagons to be delivered to the freight front);

- fictitious work (dependency) – reflects the correct relationship of works in the network schedule, does not require time and resources and shows the technological sequence of operations.

When constructing the schedule, the employment of the shunting locomotive and loading and unloading mechanisms is taken into account. In the network model, there are several paths between initial and final events, the duration of which depends on the duration of the works that make up these paths. The critical path is determined, that is, the sequence of technologically interconnected works from the initial to the final event, which has the maximum duration. The critical path includes work related to the disassembly and formation of the train, the delivery of wagons to the freight front and their cleaning, the placement, rearrangement and assembly of wagons, the performance of cargo operations and other operations and their waiting related to the processing of wagon traffic at the freight yard stations The start and end time of each operation, the time of each event, and the possibility of changing these parameters in order to optimize the network model are determined. By optimization we mean the process of improving the network schedule by reducing the total time of critical path works, which consists in reducing the duration of critical works due to improving the technology of their execution, using additional resources (shunting locomotives, loading and unloading mechanisms), redistributing resources from non-critical to critical work, thereby reducing unproductive downtime of wagons.

Therefore, network models provide a clear idea of the total volume of work at the station, provide visibility of the technological sequence of operations and the distribution of locomotives, loading and unloading mechanisms, which creates conditions for the best use of resources, allow you to forecast complex processes, identify "bottlenecks" in the operation of the station, to reduce the time spent in performing the entire complex of works, to choose the optimal option for performing operations in the process of processing car traffic at the station.

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