



## DEVELOPMENT OF A SEQUENCE OF TECHNOLOGY OF OPERATIONS WITH TRANSIT TRAINS AT THE STATION

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<https://doi.org/10.5281/zenodo.7393393>

**Abstract.** The modern measures necessary to eliminate the stopping of cars during the delivery of cargo have been analyzed the regulatory and legal framework for the delivery of goods by rail. To date, the analytical results of the speed of cargo delivery to the destination are presented in JSC "UTY". The order of the sequence of the delivery period of the cargo for the execution of operations for the departure and reception of cargo and additional operations during the route has been developed. The norms for calculating technological processes performed at the station by types of route shipments have been developed.

**Keywords:** delivery, technological process, domestic car, station, operation.

One of the factors that has a great influence on the country's economy in the performance of the transportation agreement concluded between the shipper in rail transport is the timely provision of transportation services at a high level. One of the main requirements imposed on railway transport by the shipper and the load receiver when providing Transport services is to deliver the goods to the destination specified in its term [1,2].

In accordance with paragraph 40 of the charter, cargo transportation is accepted at a high speed (freight speed) and with an increased tariffs payment (high speed ). The shipping speed is determined by the carrier in the shipping letter [8,9].

Designing the movement of trains according to the route consists in developing new methods according to today's technological processes. In this case, it is necessary to improve the duration of the processes from the start of the train to the last situation [5, 6, 11, 12, 13, 14].

$$t_{v_i-d_i} + t_{s_i-d_i} = \sum_{i=1}^{i=n} t_{st.tex_i} + \sum_{j=1}^{j=m} t_{uch_j}$$

Here  $\sum_{i=1}^{i=n} t_{st.tex_i}$  - the time of technological processes performed at the station is determined

from i to n,  $\sum_{j=1}^{j=m} t_{uch_j}$  - the time of movement of the train on the section is determined from j to m [3-5].

Since the principle of performing the operations performed at the station is the same, but the performed technological processes are different types of cargo shipment,  $t_{st.tex}$  is developed separately by shipment types.

Development of a mathematical model for the type of routed cargo shipment [4-6, 10-15].

The faster the time to travel from the station where the cargo is sent to the destination station, the use of cars is increased temporarily. The movement of cars without reprocessing along the way has a positive effect on the delivery time of goods. In the routed shipment type, the times of cars staying at a station that is not reprocessed along the way are divided into two groups, meaning, the technical station where the locomotive is exchanged and the station where the locomotive staff is exchanged [5,7].

Implementation of technological processes at the locomotive exchange technical station.

We express the total waiting time at technical stations where locomotives are exchanged during non-recycling technological processes of cars by the following formula:

$$T_{lok.al} = t_{m.t.} + t_{q.q.} + t_{b.q.} + t_{lok.uz} + t_{lok.al} + t_{lok.ul.} + t_{sh.u} + t_{tor.us.tek} + t_{b.ol.} + t_j$$

$t_{m.t.}$ - time spent preparing a route to the train, hours;

$t_{q.q.}$ - time of receiving the train at the station, hours

$t_{b.q.}$ - time to harden the contents with a spike, hour;

$t_{lok.uz}$ - Time to disconnect the locomotive from the composition, hour;

$t_{lok.al}$ - Locomotive exchanging time, hours;

$t_{lok.ul.}$ - Locomotive connection time, hours;

$t_{sh.u}$ - car brake hoses connection time, hours;

$t_{tor.us.tek}$ -time of inspection of content braking equipment, hours;

$t_{b.ol.}$ - time to take slippers from the content and issue train documents, hours;

$t_j$ - train departure time from the station, hours.

Also, the locomotive changes at the station where the cars are collected, which is the turning shoulder of the locomotive. We express the sum of the total time of the technological process at S stations, where the number of locomotive exchanges without processing cars at stations along the way is spent on them by the following formula:

$$\sum_{i=1}^S (\sum t_{ish/may}^{lok.al})_i, \text{ hours}$$

Technological processes are performed at the exchange of the locomotive staff at the station.

When the locomotive staff is changed, the trains are received at the station, the staff is changed and the brake equipment is checked and sent from the station. We determine the time spent on locomotive staff exchange using the following formula:

$$t_{lok.b.al} = t_{q.q.} + t_{b.al.} + t_j$$

$t_{q.q.}$ - time to take the train to the station, hour;

$t_{b.al.}$ - Time spent on the exchange of the locomotive staff, hours;

$t_j$ - departure time of the train from the station, hours.

We calculate the total sum as follows If our cars will exchange a locomotive staff several times along the way.

$$\sum_{i=1}^Z (\sum t_{lok.b.al})_i, \text{ coar}$$

$t_{lok.b.al}$ - it is accepted to normalize the performance of technological processes at the station, 40 min.

We will calculate the execution time of technological processes at the technical station where the locomotive will exchange [15,16,17].

Table 1

Time of technological operations performed at the technical station in the routing shipment

Conditional sign	Technological operation name	Execution time, min
$t_{m.t.}$	time spent on preparing a route for the train	5
$t_{q.q.}$	time of receiving the train at the station	1
$t_{b.q.}$	time to harden the composition with a spike	2
$t_{lok.uz}$	Time to disconnect the locomotive from the composition	2
$t_{lok.al}$	Locomotive exchanging time	23
$t_{lok.ul.}$	Locomotive connection Time	2
$t_{sh.u}$	time for connecting car brake hoses	5
$t_{tor.us.tek}$	time of inspection of content braking equipment	48
$t_{b.ol.}$	time to take slippers from the composition and issue train documents	1
$t_j$	departure time of the train from the Station	2

It can be seen from this at the station, we can see that  $T_{lok.al} \approx 1,51$  hours are spent when we exchange the locomotive staff without recycling cars. By the standard of the station's implementation of technological processes, it was necessary to organize 1 hour.

The results of the study showed that the actual failure of a non-recyclable car significantly exceeded the calculated technological norms, taking into account the force majeure time. Such ineffective parking leads to the fact that the trains do not go on schedule, do not deliver on time to the specified station.

All this leads to a decrease in the economic efficiency of not only the station, but also the railway as a whole.

The task of reducing the downtime at the station is relevant, requiring effective methods to solve it. Thus, in order to speed up the delivery of goods, it is necessary to eliminate or reduce their ineffective waiting time. To do this, it is necessary to use modern calculations of optimization, planning and modeling of work.

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