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Marufdjan Xalikovich Rasulov
*Tashkent State Transport University, Tashkent, 100167, Uzbekistan*, tashiit_rektorat@mail.ru

Sh.M. Suyunbayev
*Tashkent State Transport University, Tashkent, 100167, Uzbekistan*, shinbolat_84@mail.ru

M.N. Masharipov
*Tashkent State Transport University, Tashkent, 100167, Uzbekistan*, masudcha@mail.ru

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RESEARCH OF DEVELOPMENT PROSPECTS OF TRANSPORTATION HUB IN JSC "UMC"

Rasulov M.X.1, Suyunbayev Sh.M.1, Masharipov M.N.1
Rasulov M.X.1, Suyunbayev Sh.M.1, Masharipov M.N.1

1 – Ташкентский институт инженеров железнодорожного транспорта (Ташкент, Узбекистан)
1 – Tashkent Institute of Railway Engineers (Tashkent, Uzbekistan)

Abstract: As you know, an increase in the volume of production of any object requires to reasonably provide for a comprehensive analysis of the compliance of its technical equipment and technology of work with the prospective traffic volumes. The article analyzes the existing and prospective volumes of work, shows the results of calculations, the available throughput capacity of the station. "B" - Art. "3" and the throughput of the receiving and departure tracks stations "Z", "P" and "S", the required number of shunting locomotives has been determined, a number of measures have been proposed to improve the work of the access track of JSC "UMC".

Key words: processing capacity, throughput, industrial transport, mainline transport, interaction, compliance, shunting locomotive, daily schedule.
As a result of scientific research carried out by specialists of the Tashkent Institute of Railway Engineers, bottlenecks in the production activities of the transport hub of UMC JSC were identified, taking into account the expected volumes of freight traffic, and recommendations were proposed to ensure the efficient operation of UMC JSC when commissioning a timber processing complex CRC.

**Technical and operational characteristics of the transport hub of JSC « UMC »**. Railway transport hub of JSC "UMC" consists of 69741.47 linear meters. railway tracks, including 110.45 r. m. main running track "B" - "Sh", 5671.27 rm. the main running track "Sh" - "Z", as well as 63959.75 rm. on-site tracks of stations "Sh", "Z", "P", "S". They provide freight transportation for the delivery of raw materials from production sites to processing points. On the access track of UMK JSC, locomotives of the TEM2, TEM2-U series are used in train traffic and shunting operations [1].

Organization of work station "B" of JSC "Uzbekiston Temir Yulari" and transport hub of JSC "UMC" on the basis of the technological process of interaction ensures the consistency of the technology of work of the station and the access road, regulates the procedure for their work.

The station tracks of "B" are adjacent to 4 access tracks, of which the main share of loading falls on JSC "UMC", which provides about 20% of loading RZhU-1 JSC "UTY".

JSC "UMC" has 4 stations: "Sh", "Z", "P", "S". Currently station "Sh" is temporarily not working due to the intersection of the tracks of the section "B" - "Sh" of the territory of the neighboring state. Therefore, at all 3 stations, freight cars of the inventory park of JSC "UTY" run. Acceptance and transfer of cars from the mainline transport to JSC "UMC" is carried out through the railway station. "B" - st. "Z".

This haul is single-track, diesel traction is used, the order of movement is shunting, the means of communication are telephone and radio communications. The boundaries of stations "Z" and "S", "Z" and "P" coincide (there are no passes).

**Study of the correspondence of the processing capacity of the transport hub of JSC "UMC" with the planned traffic volumes.** The infrastructure of the serving transport subsystem (railways, stations, locomotive and carriage park, EC devices, etc.), which determines its processing capacity, was put into operation more than half a century ago.

To analyze the compliance of the technical equipment of the railway transport of the access track with the planned volume of work of JSC "UMC", graphic-analytical modeling of the operation of all stations of the transport hub was performed.

When planning organizational and technical measures aimed at improving the technical equipment and technology of operation of railway stations or access roads, the problem arises of obtaining a reliable assessment of their performance indicators after the implementation of the project. The same problem arises when determining the throughput or processing capacity of transport systems, including when solving the problem of analyzing the correspondence of the existing technical and technological parameters of the system to promising volumes of work. [2].

Traditionally, to solve these problems, a graphical model is used in the form of a daily schedule. This model has a significant information capacity and provides a high speed of search and access to the necessary information. In addition, the process of interaction between the management and engineering personnel of a station or an access road with a graphical model of the technological process is one of the most important factors that affects the nature of decisions made to improve the operation of a particular transport system. Therefore, despite the relative simplicity of the graphical model, it is widely used in railway transport when solving problems of an engineering and technical nature. The main disadvantages of the traditional methodology for the development of schedules are the low speed of constructing a graphic image and obtaining indicators of the station operation, the impossibility of taking into account the randomness of the duration of technological operations, the complexity of replicating, archiving and transferring information.

To overcome these problems, the most effective is the implementation of the development of schedules on a computer. For this purpose, the specialists of the Mining Testing Laboratory DNURT named after Academician V. Lazaryan developed a specialized software package TimetableRedactor.exe, which is a computer editor for the development of daily schedules of any complexity [3].

The capacity of the access track and inter-station routes depends primarily on the conditions for the passage of trains and transmissions, i.e. the accepted type of train schedule. On the connecting
stretch st. "B" JSC "UTY" and st. "Z" JSC "UMC" there are no intra-plant transportation, therefore the total throughput of the haul coincides with its throughput for external transportation.

Due to the specifics of the work of JSC "UMK" Cat all cargo objects, there are no double operations for loading wagons. The calculation of the daily volumes of carriages arriving at JSC "UMK" showed that at present the car turnover of JSC "UMC" is 216 wagons / day, and after the launch of the timber processing complex - 578 wagons / day (Table 1-2).

### Table 1

<table>
<thead>
<tr>
<th>Train number</th>
<th>Number of wagon</th>
<th>Of them:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>loaded</td>
<td>empty</td>
</tr>
<tr>
<td>1</td>
<td>27</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>27</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>27</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>108</td>
<td>63</td>
<td>45</td>
</tr>
</tbody>
</table>

### Table 2

<table>
<thead>
<tr>
<th>Train number</th>
<th>Number of wagon</th>
<th>Of them:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>loaded</td>
<td>empty</td>
</tr>
<tr>
<td>1</td>
<td>38</td>
<td>26</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>35</td>
<td>29</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>38</td>
<td>26</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>33</td>
<td>23</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>34</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>6</td>
<td>37</td>
<td>24</td>
<td>13</td>
</tr>
<tr>
<td>7</td>
<td>36</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>38</td>
<td>25</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>289</td>
<td>187</td>
<td>102</td>
</tr>
</tbody>
</table>

The current volume of local traffic is 162 wagons per day. After the launch of the timber processing complex, the number of local traffic will increase by 36 cars and will amount to 198 cars per day. The existing amount of processed car traffic on the receiving and departure tracks st. "Z" JSC "UMC" will be 108 + 162 = 270 wagons per day. After the launch of the CRC, the amount of processed car traffic on the receiving and departure tracks of st. "Z" will be 289 + 198 = 487 wagons per day.

The expected volumes of production at JSC "UMC" necessitate the calculation of the throughput of the adjacent section of JSC "UMC" to station "B" of JSC "UTY" and all three stations: "Z", "P", "S". First, we will consider the correspondence of the throughput of the section of st. "B" - st. "Z" the expected volume of cargo traffic.

For a parallel train schedule, the estimated throughput of a single-track haul (in wagons) is determined by the formula [4]:

$$n = \frac{2m(1440 - T_{ok})}{t_1 + t_2 + t_{is} + t_{as}} \text{, wagons}$$

(1)

where $m$ – weighted average number of wagons in a train or group, wagons;

$T_{ok}$ – approved by the length of the "window" on the considered stretch, min.;

$t_1$ and $t_2$ - schedule time of the train running along the haul in one direction and the other, min.;

$t_{is}$ and $t_{as}$ – established station intervals, respectively, for an industrial station and an abutment station, min.
The results of calculating the throughput of the section of st. "B" - st. "Z" according to the expected volume of freight traffic, are shown in Fig. 1.

Fig. 1 shows that the available carrying capacity of the section of st. "B" - st. "Z" does not allow the expected traffic flows after the start of the CRC with the existing technical and operational characteristics of the haul (the average train composition is 27 wagons and the schedule period is 205 minutes). Therefore, it is proposed to reduce the schedule period to 140 minutes and increase the train composition to 36 wagons on average. This, in turn, requires the use of more powerful locomotives for the production of operations for the reception and delivery of wagons from / to st. "B" JSC "UTY".

To calculate the throughput of industrial stations for track development, it is necessary to take into account that one of the main features of many industrial stations is the absence of a solid specialization of tracks on them. Because of this, the throughput and processing capacity should be determined in total for the entire station track development intended for receiving, sending and sorting wagons. For such stations, the main throughput (in wagons) can be calculated using the formulas used for stations of mainline railway transport [4]:

\[ n = \frac{(T - T_{tot}) \cdot m}{T_{tec}}, \text{ wagons} \]  

(2)

here \( \Pi \) – total number of tracks in an industrial station, \( \Pi = 5 \);

\( T \) – the value of the accepted period of operation of the object per day, \( T = 24 \) hours;

\( m \) – weighted average number of wagons in a train or group, wag. (from Table 1-2);

\( T_{tot} \) – total time of occupation of tracks by operations not related to the passage of trains, \( T_{POST}=1,5 \) hour;

\( T_{tec} \) – total estimated time of occupation of the path for receiving, processing, departure and accumulation by one train or group, \( T_{tec}=365 \) min.

The results of calculating the throughput of the railway industrial station "Z" are shown in Fig. 2. From Fig. 2 it can be seen that the throughput of the receiving and departure tracks of st. "Z" if available 5th receiving and departure tracks does not allow processing the expected volume of car traffic after the launch of the CRC. Therefore, it is proposed to build 2 additional receiving and departure tracks at st. "Z".

Fig. 1. The throughput capacity of the station. "B" - st. "Z". 
Also, the calculation of the throughput of the railway industrial station "P" and "S" was made. It was revealed that the throughput of the receiving and departure tracks of st. "P" if available of one receiving-departure track does not allow to process the expected volume of wagon traffic after the launch of the CRC. Therefore, it is proposed to build also 2 additional receiving and departure tracks at st. "П". The throughput of the receiving and departure tracks of st. "П" has a reserve of 31% and after the launch of the CRC. Based on this, on St. "Severnaya" does not require the implementation of measures for track development.

On the basis of the compiled daily schedules of the transport hub of JSC "UMC", the loading of shunting locomotives was calculated according to the method [5]. The calculation results are shown in table. 3.

From table. 3 it can be seen that in order to match the processing capacity of the transport hub of JSC "UMC" to the planned volume of traffic, it is necessary to purchase 2 units locomotives with a capacity of 1200 hp: 1 unit for use as export for train work and 1 unit to ensure the flow of timber industry complex CRC.

**Conclusion.** To develop proposals for improving the operation technology of the transport hub of UMC JSC, taking into account the expected volumes of freight traffic, two variants of the daily schedule of the unit's operation were drawn up: the first for existing wagon flows, the second for the expected wagon flow after the launch of the CRC.

The calculation of the daily volume of work showed that at present the wagon turnover of JSC "UMC" is 216 wagons / day, and after the launch of the timber processing complex CRC - 578 wagons / day.

Real carrying capacity of the section "B" - st. "Z" does not allow the expected traffic flows after the start of the CRC with the existing technical and operational characteristics of the section (the train has an average of 27 wagons and the schedule period is 205 minutes). Therefore, it is proposed to reduce the schedule period to 140 minutes and increase the train composition to 36 wagons on average. This, in turn, requires the use of more powerful locomotives for the production of operations for the reception and delivery of wagons from / to st. "В" JSC "УТУ".
### Table 3

The workload of the operated fleet of shunting locomotives of JSC "UMC"

<table>
<thead>
<tr>
<th>Locomotive</th>
<th>Workload</th>
<th>Locomotive</th>
<th>Workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>54,8</td>
<td>1</td>
<td>82,1</td>
</tr>
<tr>
<td>2</td>
<td>57,9</td>
<td>2</td>
<td>88,4</td>
</tr>
<tr>
<td>3</td>
<td>82,3</td>
<td>3</td>
<td>82,8</td>
</tr>
<tr>
<td>4</td>
<td>70,8</td>
<td>4</td>
<td>81,5</td>
</tr>
<tr>
<td>5</td>
<td>91,0</td>
<td>5</td>
<td>91,5</td>
</tr>
<tr>
<td>6</td>
<td>61,3</td>
<td>6</td>
<td>80,8</td>
</tr>
<tr>
<td>7</td>
<td>59,6</td>
<td>7</td>
<td>94,8</td>
</tr>
<tr>
<td>8</td>
<td>75,3</td>
<td>8</td>
<td>88,9</td>
</tr>
<tr>
<td>Reserve 9</td>
<td>Reserve diesel locomotive</td>
<td>9</td>
<td>90,0</td>
</tr>
<tr>
<td>Reserve 10</td>
<td>At the stage of overhaul</td>
<td>10</td>
<td>81,3</td>
</tr>
<tr>
<td>11</td>
<td>The service life has expired (35 years). Write-off required</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The throughput of the receiving and departure tracks of st. "Z" with 5 receiving and departure tracks also does not allow timely processing of the expected volume of wagon traffic after the launch of the CRC. Therefore, it is proposed to build 2 additional receiving and departure tracks at st. "Z".

The throughput of the receiving and departure tracks of st. "P" with the number of 2 receiving and departure tracks also does not allow timely processing of the expected volume of wagon traffic after the launch of the CRC. Therefore, it is proposed to build an additional receiving and departure track at st. "P".

The throughput of the receiving and departure tracks of st. "C" has a reserve of 31% and after the launch of the CRC. Based on this, on st. "Severnaya" does not require additional track development.

Based on the results of the drawn up daily work schedule of the transport hub of JSC "UMC", it is proposed to purchase 2 units -locomotives with a capacity of 1200 hp: 1 unit- for use as export for train work and 1 unit- to ensure the flow of timber industry complex CRC.

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Сведения об авторах / Information about authors
Расулов Маруфджан Халикович – к.т.н., профессор, ректор, Ташкентский институт инженеров железнодорожного транспорта, e-mail: tashiit_rektorat@mail.ru
Суюнбаев Шинполат Мансуралиевич – к.т.н., доцент кафедры «Управление эксплуатационной работой железной дороги», Ташкентский институт инженеров железнодорожного транспорта, e-mail: shinbolat_84@mail.ru
Машарипов Манузд Нумонжонович – PhD, декан экономического факультета, Ташкентский институт инженеров железнодорожного транспорта, e-mail: masudcha@mail.ru

Rasulov Marufdjan Xalikovich – c.t.s., professor, rector, Tashkent Institute of Railway Engineers, e-mail: tashiit_rektorat@mail.ru
Suyunbayev Shinpolat Mansuralievich – c.t.s., docent of the department "Management of operational work of the railway", Tashkent Institute of Railway Engineers, e-mail: shinbolat_84@mail.ru
Masharipov Masud Numonzhonovich – PhD, Dean of the Faculty of Economics, Tashkent Institute of Railway Engineers, e-mail: masudcha@mail.ru