

## EFFICIENCY OF EXTENSION OF RECEIVING-SENDING WAYS OF “XAMZA” RAILWAY STATION

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**Abstract.** Recommendations have been developed to improve the shunting operations for processing thermal trains arriving at the “Xamza” railway station. In particular, it was proposed to extend the reception and departure tracks of station “X” by 125 meters. The cost of purchasing, designing, and installing one meter of rail is calculated on the website <https://www.rails.ru/>. As a result, the annual economic impact of efficient shunting operations for road expansion has been calculated, and the payback period for the proposed project has been determined to be 3 years.

### Introduction

The “Xamza” station, in terms of its operation and track development, is classified as a freight station, and by the volume of operational work, it belongs to the third category. The station is located on the main route, on the Tokimachi-Tashkent route.

Wagons are predominantly delivered to the station by thermal and transfer freight trains. One of the main problems in this regard is that arriving trains do not fit onto the reception and departure tracks, and shunting operations have to be performed excessively (Fig. 1).

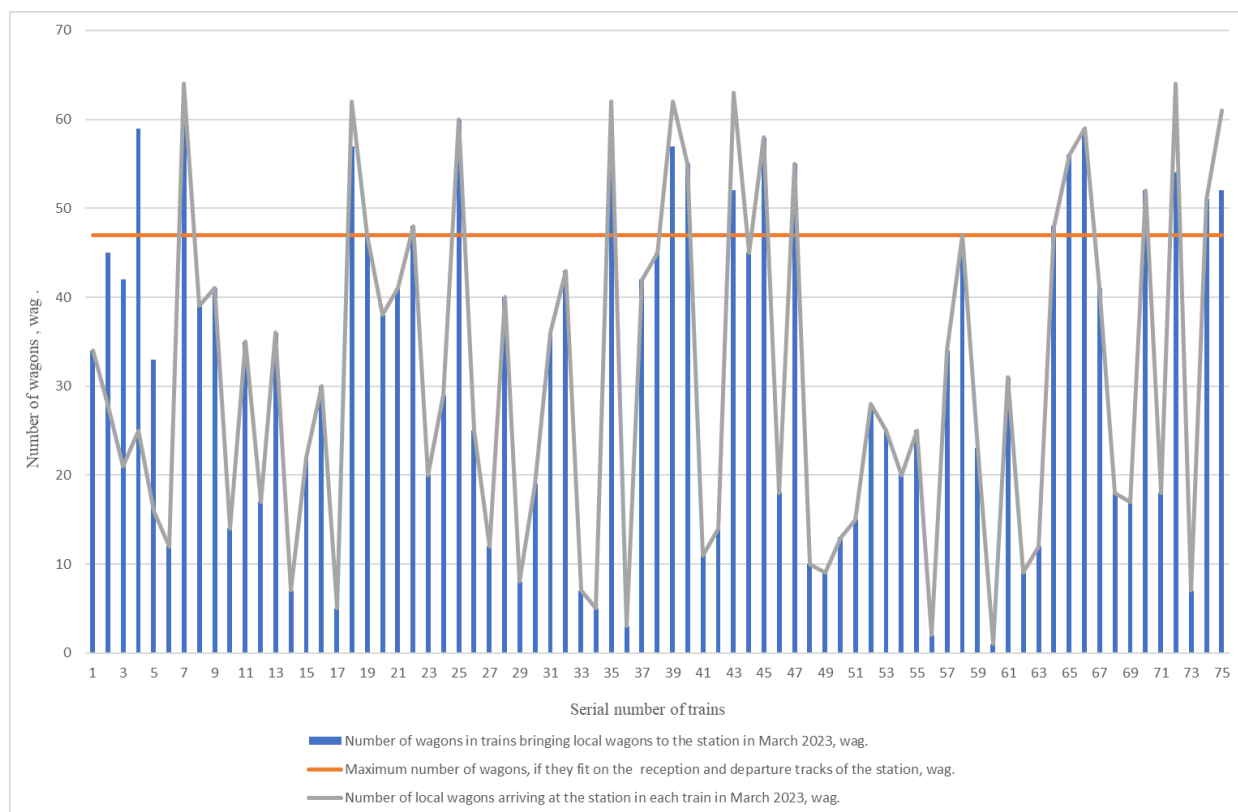


Figure 1. Analysis of the number of local carriages in the thermal trains arriving at the “Xamza” station in February 2024

As shown in Figure 1, out of 75 trains arriving in one month (20%), 8 wagons on average did not fit onto the reception and departure tracks of the station. Therefore, the expansion of the reception and departure routes of the “Xamza” station is a pertinent issue.

**Calculation of shunting performance indicators for attaching and detaching wagons to the thermal train considering the current situation**

According to statistical data, each thermal train delivers an average of 33 wagons to the “Xamza” station. Therefore, based on the current situation, the shunting performance indicators for attaching and detaching 33 wagons from the thermal train were calculated, including the number of shunting half-runs, the time spent on them, and the amount of fuel (Table 1).

Table 1

Shunting performance indicators for attaching and detaching wagons to the thermal train depending on the current situation

| T/r    | Half flight limit |       | Distance, m | Time spent, min | Fuel consumption, kg | Wagons the number |
|--------|-------------------|-------|-------------|-----------------|----------------------|-------------------|
|        | from              | up to |             |                 |                      |                   |
| 1      | 2                 | 3     | 4           | 5               | 6                    | 7                 |
| 1      | 2a                | CH3   | 209.92      | 0.6             | 0.63                 | -                 |
| 2      | CH3               | M21   | 316.08      | 0.9             | 0.73                 | -                 |
| 3      | M21               | CH1   | 197.16      | 0.6             | 0.62                 | -                 |
| 4      | CH1               | M21   | 692.16      | 2.5             | 2.48                 | 33                |
| 5      | M21               | CH3   | 794.58      | 2.7             | 0.6                  | 33                |
| 6      | CH3               | 2a    | 150.32      | 0.5             | 0.57                 | -                 |
| 7      | 2a                | CH2   | 166.82      | 0.5             | 0.59                 | -                 |
| 8      | CH2               | M21   | 811.08      | 2.8             | 2.62                 | 33                |
| 9      | M21               | CH1   | 712.16      | 2.5             | 2.5                  | 33                |
| 10     | CH1               | M21   | 217.16      | 0.6             | 0.63                 | -                 |
| 11     | M21               | CH2   | 318.08      | 0.9             | 0.73                 | -                 |
| 12     | CH2               | 2a    | 166.82      | 0.5             | 0.59                 | -                 |
| Total: |                   |       | 4754.32     | 15.6            | 15.29                |                   |

According to Table 1 data, 8 out of 12 half-runs (67%) performed by the shunting locomotive during movement correspond to its standby (without wagons) movement. The time required for shunting operations to attach and detach 33 wagons is 15.6 minutes, and the fuel consumption is determined to be 15.29 kg.

**Calculation of shunting performance indicators for attaching and detaching wagons from the thermal train after extending the reception and departure tracks**

As mentioned above, the reception and departure tracks of the “Xamza” station cannot accommodate an average of 8 wagons. The average length of freight wagons is 14.5 meters. Therefore, it is proposed to extend the reception and departure tracks of the station by a minimum of 116 meters. However, considering the standard length of rails at 12.5 meters, it is recommended to extend the project by 125 meters. After extending the reception and departure routes, the shunting operation indicators for attaching and detaching 33 wagons from the thermal train were calculated, including the number of shunting half-runs, the time spent on them, and the fuel consumption (Table 2).

According to Table 2 data, 4 out of 8 half-runs (50%) performed by the shunting locomotive during its operation correspond to its standby (wagon-less) operation, 12 out of 33 wagons are coupling and uncoupling shunting operations, 6 minutes of time, and 12.48 kg of fuel are consumed. Thus, after expanding the reception and departure routes, the number of half-runs spent on attaching and detaching wagons to the thermal train will decrease from 12 to 8 (33%), the time spent on them will decrease by 19%, and fuel consumption will decrease by 21%.

Table 2

Shunting operation indicators for attaching and detaching wagons from the thermal train after extending the reception and departure tracks

| T/r    | Half flight limit |       | Distance, m | Time spent, min | Fuel consumption, kg | Wagons the number |
|--------|-------------------|-------|-------------|-----------------|----------------------|-------------------|
|        | from              | up to |             |                 |                      |                   |
| 1      | 2                 | 3     | 4           | 5               | 6                    | 7                 |
| 1      | 2a                | CH3   | 166.82      | 0.5             | 0.59                 | -                 |
| 2      | CH3               | M 17  | 747.68      | 2.6             | 2.54                 | 33                |
| 3      | M 17              | CH4   | 768.54      | 2.7             | 2.57                 | 33                |
| 4      | CH4               | M17   | 273.54      | 0.8             | 0.69                 | -                 |
| 5      | M17               | CH2   | 240.24      | 0.7             | 0.66                 | -                 |
| 6      | CH2               | 2a    | 645.32      | 2.4             | 2.41                 | 33                |
| 7      | 2a                | CH3   | 661.82      | 2.4             | 2.43                 | 33                |
| 8      | CH3               | 2a    | 166.82      | 0.5             | 0.59                 | -                 |
| Total: |                   |       | 3670.78     | 12.6            | 12.48                |                   |

### Results and their discussion

Reducing time and fuel costs in the servicing process of thermal trains by extending the reception and departure routes leads to a reduction in the time locomotives and train engineers spend at the station, savings in shunting costs, and a decrease in the time idle train wagons spend. The economic efficiency was calculated based on methodologies presented in scientific papers [1-6].

Expanding railway routes entails capital expenditures. The purchase, design, and installation of one meter of rail were calculated on the website <https://www.rails.ru/>. As a result, it was determined that the costs for acquiring, designing, and installing 125 meters of rails would amount to 200 million sum. The annual economic impact of efficiently organizing shunting operations with road extension amounted to 65 million sum. It was determined that the payback period of the proposed project would be 3 years.

### Summary

Wagons are primarily delivered to the "Hamza" station by thermal and transfer freight trains. One of the main problems is that arriving trains do not fit onto the reception and departure tracks, resulting in excessive shunting operations. Analysis of the station's operation revealed that out of 75 trains arriving in a month, 15 (20%) did not fit onto the station's reception and departure tracks. Therefore, it is proposed to expand the reception and departure routes of the "Hamza" station. Efficiency indicators of the station were calculated by extending the reception and departure routes, and subtracting capital expenditures, determining that the payback period of the proposed project corresponds to 3 years.

### References

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