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About the Difficulty of the Path Profile of the Marokand – Kattakurgan Section of the Uzbek Railway

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Annotation:

This article relates to research into the effectiveness of using mainline (train) locomotives of diesel traction on sections of the Uzbek railways of varying complexity. The obtained values of the criterion for assessing traction quality and the properties of the track profile made it possible to select the most difficult section of the studied hilly-mountainous section of the Uzbek railway with diesel traction for traffic conditions without stops at intermediate stations. The results of the study are recommended to specialists of the locomotive complex to substantiate the consumption standards of natural diesel fuel for traction of trains and to assess the difficulty of crossing the profile of the track and route of the railway line (direction) Samarkand - Navoi - Bukhara.

Keywords: investigation, cargo train, diesel locomotive, railway track, exploitation, the haul, analyses, the station, hilly - mountainous.

At the Department of “Locomotives and Locomotive Facilities”, research is being conducted to substantiate the efficiency of transportation work of various types (series) of diesel locomotives on sections of the railways of «Uzbekistan Temir Yollari» JSC of varying difficulty.

Plain, hilly, hilly-mountain and mountain types of railway sections [1], first of all, are characterized by the sequence of location and mutual combination of different elements of the track profile in structure and content, together with curved sections of varying length and of curvature.

These studies consist of substantiating the traction qualities of the track profile sections on one of the real sections of the Uzbek railways, taking into account the parameters of the main indicators of fuel - energy efficiency of mainline (train) locomotives diesel traction freight.

The object of the study is three-section mainline (train) freight diesel locomotives of the UzTE16M3 series and the track profile of the Marokand - Kattakurgan section of the hilly - mountainous direction Samarkand - Navoi - Bukhara of Uzbekistan Temir Yollari JSC.

The subject of the study was the kinematic parameters of the movement of a freight train of a minimum train mass and the fuel and energy efficiency indicators of the studied UzTE16M3 diesel locomotives on a given section of Marokand - Kattakurgan of the Uzbek Railway.

Based on work [2] and data from works [3, 4], the research methodology provided for the justification and assessment of traction quality and properties of the track profile to be carried out according to the criterion of the difficulty of each stretch of a given section of Marokand - Kattakurgan when freight trains move without stopping at intermediate stations of the railway section under study roads.

As an evaluation criterion [5], the given values of the total (full) and specific consumption of natural diesel fuel for train traction were used, that is, the consumption of natural diesel fuel of a diesel locomotive distributed per unit time of operation of the locomotive power plants in mode traction for the conditions of organizing railway cargo transportation without stops at intermediate stations.

In table 1 and figure 2 shows the kinematic parameters of the movement of a freight train with a minimum mass of the train Q = 2500 t (number of axles m = 200 axles) and the consumption of natural diesel fuel by mainline (train) freight diesel locomotives UzTE16M3 along the runs of a given hilly-mountainous section Marokand - Kattakurgan JSC "Uzbekistan Temir Yo'llari" » for freight train traffic conditions indicated above.

Table 1 Kinematic parameters of freight train movement on the Marokand – Kattakurgan section, movement without stops

No. by order	Stages	Technical speed V_t, km/h	Train running time, min		
			along the hauls	in mode	
				traction	idling and braking
1	Marokand – Juma	56,84	9,60	4,30	5,30
2	Juma - Nurbulak	68,90	24,80	7,50	17,30
3	Nurbulak - Kattakurgan	61,67	23,90	6,05	17,45
4	Marokand – Kattakurgan	65,04	57,90	17,85	40,05

Table 2 Consumption of natural diesel fuel by diesel locomotives UzTE16M3 on the section Marokand - Kattakurgan, movement without stops

No. by order	Stages	General by hauls and section *E*, kg Specific by hauls and section *e*, kg/10^4 tkm gross
1	Marokand – Juma	99,81 / 43,90
2	Juma - Nurbulak	115,10 / 16,15
3	Nurbulak - Kattakurgan	107,75 / 17,84
4	Marokand – Kattakurgan	322,66 / 20,90

In fig. 1 shows histograms of the total (full) and specific consumption of natural diesel fuel by mainline (train) freight diesel locomotives UzTE16M3 on the Marokand-Kattakurgan section of «Uzbekistan Temir Yollari» JSC and the indicator of the difficulty of the track profile of this section.

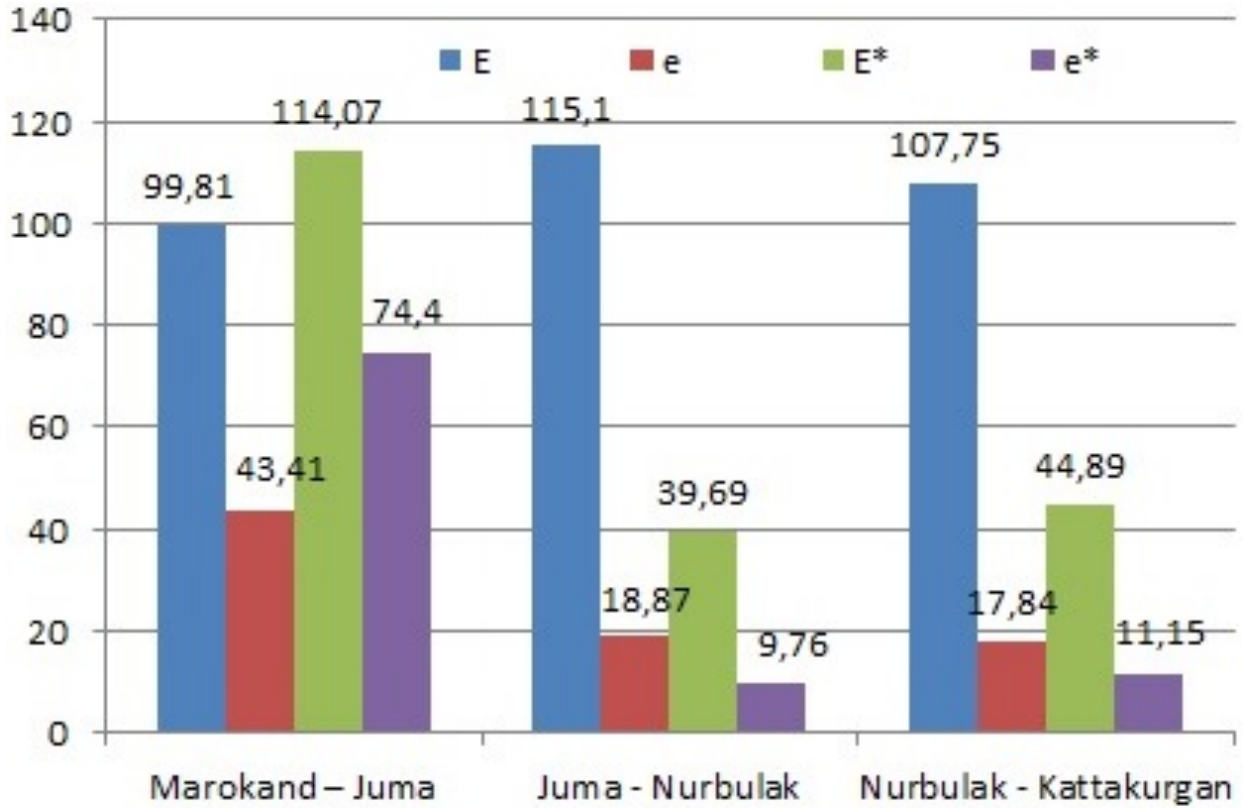

Figure 1. Dynamics of consumption of natural diesel fuel by diesel locomotives UzTE16M3 on the section Marokand - Kattakurgan, movement without stops

The ordinate axis shows the values of natural diesel fuel consumption for train traction: E, e – total (full) and specific, respectively, and E*, e* – respectively, given total (full) and specific. The values of the evaluation criterion E* and e* of the difficulty of the path profile in fig. 1 are, respectively, increased by 10 times and 15 times.

Analysis of table values 1 and the results of research [3,4] show that the movement of freight trains on the above-mentioned section Marokand - Kattakurgan of «Uzbekistan Temir Yollari» JSC, organized without stops at intermediate stations, sidings and separate points, contributes:

- reducing the train travel time by 7.20 minutes and increasing the technical speed by 8.05 km/h with an average estimated time per stop of approximately 2.40 minutes;
- the share of movement in modes traction is 25.84 percent, and idling and braking is 74.16 percent;
- Reduction in the share of movement in mode traction and its increase in idling and braking mode by 4.99 percent compared to the movement of a freight train with stops at intermediate stations and sidings.

The research results and data from [3,4] made it possible to identify the following general conclusions.

1. For the main indicators of the efficiency of using the mentioned UzTE16M3 diesel locomotives on the Marokand – Kattakurgan section:

- the average estimated travel time of a freight train along hauls without stopping at intermediate stations, separate points and sidings is 16.90 minutes;
- driving freight trains without stopping at intermediate stations, sidings and separate points, compared to driving them with stops at them, helps to reduce the total (full) and specific consumption of natural diesel fuel, respectively, by 25.30 and 25.28 percent;
- natural diesel fuel consumption for one stop at an intermediate station and sidings is 54.63 kg, and for one acceleration - deceleration this consumption, on average, corresponds to 32.64 kg/stop.

2. In addition, the value of the reduced consumption of natural diesel fuel total (E*, kg / km) and specific (E*, kg / 10^4 tkm gross: km) for each haul of the hilly-mountainous section of Marokand - Kattakurgan is:

- on the Marokand – Juma haul - 10,974 / 4,827 units;
- on the Juma - Nurbulak haul - 4,037 / 0,566 units;
- on the Nurbulak – Kattakurgan haul - 4,460 / 0,738 units.

Thus, the analysis and assessment of the difficulty (complexity) of the track profile of the Marokand-Kattakurgan section of the Uzbek railway of the hilly-mountainous direction Samarkand-Navoi-Bukhara showed that the Marokand-Juma haul is difficult, and the Juma-Nurbulak and Nurbulak-Kattakurgan hauls are relatively easy.

The research results will be useful to machinists - heat engineering instructors and specialists of the operation workshop of the Bukhara locomotive depot, whose professional and production activities are directly related to the development of natural diesel fuel consumption standards for train traction and the assessment of traction quality and properties of sections of the track profile and route of the railway line (direction) Samarkand - Navoi - Bukhara.

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