

## PROSPECTS OF ULAN BATOR RAILWAY

**Baljir, Munkhdelger** – Ph.D. student at the department of operation management and transport safety of Moscow State University of Railway Engineering (MIIT), Moscow, Russia / Ulaanbaatar, Mongolia.

### ABSTRACT

As of 2013 the total volume of freight traffic on the JSC «Ulan Bator Railway» has reached 21 million tons, which is 1.5 times more than in 2009. According to current projections, the current volume of freight traffic will increase by about three times in 2020 and will reach 45.1 million tons. With intense development of the mining industry of Mongolia and transportation of its products to China track facilities and infrastructure in general are in a critical condition. There are many «bottlenecks» on the main track. All these factors constrain the use of available capacity of new locomotives, limit their speed, and reduce weight of trains and axle load. To ensure prospective traffic volumes JSC «Ulan Bator Railway» should carry out technical modernization.

### ENGLISH SUMMARY

#### Background.

The largest line in Mongolia is Transmongolian main line Sukhbaatar – Ulaanbaatar – Dzhamyn-Ude, which is owned by JSC «Ulan Bator Railway» (hereinafter – UBTZ). Its length is 1111 km (Pic. 1). Due to the construction of this main line rail route from Europe to Central Asia fell by 1,025 km. This main line is single-track and equipped with semi-automatic blocking.

Mongolia has an important strategic position in the organization of Eurasian transit of containerized cargo from China to Europe. In addition, it has obvious advantages: shorter route, same gauge as at Russian railways, common technical standards with them and in the future common information technology base with Russia.

Prior to 1995, all foreign trade goods were loaded at the station Erlian (China), but with the construction of the station Dzhamyn Ude, modern transshipment point, now all Chinese shipments go through Mongolian freight forwarding center.

Today, the activity of freight forwarding center in Mongolia can be compared with the activities of road center of transport service (RCTS) of JSC «Russian Railways».

#### Objective.

The objective of the author is to investigate means to increase carrying capacity of Ulan Bator main line from the standpoint of existing development strategies.

#### Methods.

The author uses methods of statistical analysis and comparison.

#### Results.

Volume of passenger traffic on UBZhD is small. On average, one fast train and two passenger trains pass through a line per day. Carrying capacity between two border stations Sukhbaatar and Naushki (Russia) – 12–13 pairs of trains per day, and between stations Erlian (China) and Dzhamyn-Ude – 9–11 pairs. Actually the Russian border is crossed by 4 pairs of trains per day, and Chinese by 7 pairs. And volume of goods to China is gradually increasing. Critical rate of trains: weight amounts to 2500 to 5000 gross tons. This difference stems from the fact that at the section Zunhara- Ulan Bator in an odd direction there is a sharp grade. The average speed of freight trains is 50 km/h

In 2011, road loading was 14.3 million tons, in 2012–20.02 million tonnes (source: Department of Statistics and Planning of JSC «Ulan Bator Railway»).

According to current projections, the current volume of freight traffic will increase significantly in 2020 and will reach 45.1 million tons.

Table 2 shows the distribution of traffic flow on the line for each section in even and odd directions. It should be noted that export to China in even direction amounts to about 68.2%. This is due to the fact that currently in Mongolia mining industry is booming and its potential consumer is primarily a neighboring country with one of the largest economies in the world. In odd direction a portion of traffic flow constitutes local transportation, in particular from the section of Ulaanbaatar-Cojir and Cojir-Saynshad. This is primarily due to the fact that in these areas there are major coal mines, which provide population of the capital and neighboring settlements with fuel. It is important to keep in mind to evaluate freight flows the fact that import from China grows every year, and hence the proportion of the loading directions will line up more.

The rolling stock fleet of JSC «UBTZ» includes:

- freight cars of all types – 2569;
- long distance passenger cars – 261;
- locomotives – 118, incl. locomotives of 2M62MM type – 26; 2M62M type – 46, DASH7 type – 2 locomotives, ZAGAL type – 5; M62UM type – 14; TEM type-25.

The program of technical modernization of the railway until 2020 provides for the purchase of another 4,000 freight cars and a large number of locomotives. This idea is mapped out for years, with account of increase in raw material extraction in Mongolia and applications for transportation of goods. The pace of economic development of the country requires immediate renovation of rolling stock, in which 60% of locomotives with expired service life, 49.1% of freight and 57% of passenger cars running in excess of lifetime.

While maintaining the pace of development of the mining industry of Mongolia track facilities of JSC «UBTZ» may be in a very critical condition. Given that export to China amounts to more than 75% of total freight flows in even direction, the problem of «bottlenecks» at the main track exacerbates. Curves of radius less than 600 m occupy 51% of its length, with sharp grades with 9000 ascent and descent – 37%, in addition, more than 600 km of tracks require major overhaul. All these factors constrain the use of the available power of locomotives, limit their speed, and reduce weight of trains and axle load. To ensure prospective traffic volumes, technical modernization should be carried out as soon as possible.

Specialists of JSC «Ulan Bator Railway» and JSC «Russian Railways» have elaborated a development concept for Ulan Bator railway and construction of a new railway infrastructure in Mongolia.

This project creates favorable conditions for mutually beneficial long-term cooperation between Russia and Mongolia in the field of transport.

This concept provides:

- modernization of existing network of JSC «Ulan Bator Railway»;
- renewal and expansion of the rolling stock fleet;
- construction of a new railway line Zuunbayan-Dalanzadgad (Tavantolgoi), the length will be 507 km;
- construction of a new line-Sainshand Bayantumen, the length will be 498 km.

As a result of modernization in addition to traffic growth in the local transportation and export shipments, favorable conditions for transit and import shipments



Table 1

## Technical characteristics of sections

№	Наименование участка <i>Name of a section</i>	Длина участка, км <i>Length of a section, km</i>	Критическая норма веса поездов, тонн брутто <i>Critical rate of trains weight, gross tons</i>		Потребная провозная способность, млн т нетто <i>Required carrying capacity, million tons net</i>		Средства сигнализации и связи <i>Means of signaling and communication</i>	Среднее время хода грузового поезда, час <i>Average running time of freight trains, hour</i>	
			Чет. напр. <i>Even</i>	Нечет. напр. <i>Odd</i>	Чет. напр. <i>Even</i>	Нечет. напр. <i>Odd</i>		Чет. напр. <i>Even</i>	Нечет. напр. <i>Odd</i>
1	Сухэ-Батор–Зунхара <i>Sukhbaatar-Zunhara</i>	225	5000	5000	13,4	14,5	п/а <i>semi-aut.</i>	3,2	3.1
2	Зунхара–Улан-Батор <i>Zunhara-Ulan Bator</i>	171	4500	2500	16,1	6,7	п/а <i>semi-aut.</i>	3,8	3.2
3	Улан-Батор–Багахангай <i>Ulan Bator-Bagahangay</i>	107	4500	4500	15,1	18,12	п/а <i>semi-aut.</i>	7,5	5
4	Багахангай–Чойр <i>Bagahangay-Cojr</i>	140	5000	4500	11,2	11,2	п/а <i>semi-aut.</i>	8,0	7.8
5	Чойр–Сайншанд <i>Cojr-Sainshand</i>	226	4500	4500	10,1	7,56	п/а <i>semi-aut.</i>	6,8	6.8
6	Сайншанд–Дзамын-Удэ <i>Sainshand-Dzamyun-Ude</i>	240	4500	4500	11,2	9,6	п/а <i>semi-aut.</i>	7,2	6

Table 2

## Percentage distribution of freight flows on sections and directions

Наименование участка <i>Name of a section</i>	Грузопоток/ <i>Freight flow</i>							
	Четный (из России в Китай) <i>Even (from Russia to China)</i>				Нечетный (из Китая в Россию) <i>Odd (from China to Russia)</i>			
	Местные/ <i>local, %</i>	Экспорт/ <i>export, %</i>	Импорт/ <i>import %</i>	Транзит/ <i>transit, %</i>	Местные/ <i>local, %</i>	Экспорт/ <i>export, %</i>	Импорт/ <i>import, %</i>	Транзит/ <i>transit, %</i>
Сухэ-Батор–Зунхара <i>Sukhbaatar-Zunhara</i>	9	56,8	17,5	16,7	57	22,7	4,5	14,2
Зунхара–Улан-Батор <i>Zunhara-Ulan Bator</i>	10	55,8	17,5	16,7	59,7	22	4,4	13,9
Улан-Батор–Чойр <i>Ulan Bator-Cojr</i>	6	71,8	3,5	18,7	79,9	3	14,7	2,4
Чойр–Сайншанд <i>Cojr-Sainshand</i>	5,1	77,4	0,8	16,7	70,5	0,2	23	6,3
Сайншанд–Дзамын-Удэ <i>Sainshand-Dzamyun-Ude</i>	3,5	79,4	0,5	16,6	56,1	1,7	38	4,2

are provided. This is an additional resource for those countries that do not have direct access to the ports.

To justify effective solutions to railway modernization it is necessary to:

1. Identify activities that are required to increase carrying capacity and estimated capacity of sections and stations.

2. Assess from technical and economic prospective multi-step schemes for increase in carrying capacity and estimated capacity of sections and stations.

3. Identify principles for development of JSC «Ulan Bator Railway» with regard to development of advanced traffic volume for the period up to 2020.

4. Propose methods of increasing carrying capacity and estimated capacity of sections and stations in the future.

To select actions aimed at increasing carrying capacity of sections, their characteristics and the possibility of using innovative resources in the

current economic situation are to be analyzed. In the ten-year plan provided for by JSC «UBTZ» appear only issues related to diesel traction. This is due to financial constraints in the construction of a new thermal power plant and a number of other facilities that are necessary for the implementation of electric traction. Possibility to put the line to the service of electric locomotives is not provided for in terms of development of the country for 2010–2020, and such a reality should be taken into account.

Freight flow growth has revealed the need to strengthen the carrying capacity of a single-track line (prior to its transformation to double-track), which in turn is implemented by the application of less costly measures than the construction of a second main track.

Selection in this situation is based on the following data:

4. Average length of hauls is 23–30 km (as an example, section Sainshand-Dzamyun-Ude, see

Table 3

Length of hauls and run-times of freight and passenger trains

п/п	Наименование перегона Name of a haul	Расстояние, км Length, km	Время хода грузовых поездов, мин Run-time of freight trains, min		Время хода пассажирских поездов, мин Run-time of passenger trains, min	
			чет/even	неч/odd	чет/even	неч/odd
1	Сайншанд–Тушлэг Sainshand-Tushleg	31	43	43	24	26
2	Тушлэг–Оргон Tushleg-Orgon	32	47	38	25	24
3	Оргон–Долоодын хондий Orgon-Doloodyn Honda	25	31	26	20	23
4	Долоодын хондий–Улаан-уул Doloodyn Honda-Ulaan Ulul	22	26	26	18	22
5	Улаан-уул–Номт Ulaan Ulul-Nomt	20	26	22	21	17
6	Номт–Цагаанхад Nomt-Tsagaanhad	21	24	14	11	12
7	Цагаанхад–Сумангийн зоо Tsagaanhad-Sumangiyn zoo	6	34	15	13	17
8	Сумангийн зоо–Авгын гол Sumangiyn zoo-Avgyn goal	13	16	22	11	13
9	Авгын гол–Нартын хошуу Avgyn goal-Nartyn Hoshu	23	26	38	19	20
10	Нартын хошуу–Шаргын овоо Nartyn Hoshu-Shargyn ovoo	22	24	40	17	22
11	Шаргын-Овоо–Дзамын-Удэ-2 Shargyn Ovoo Dzamyn-Ude-2	16	15	19	13	18
	Дзамын-Удэ-2–Дзамын-Удэ-1 Dzamyn Ude-2-Dzamyn Ude-1	4	5	5	5	5

Table 3), which significantly affects their carrying capacity. Therefore it is necessary to assess the feasibility of building additional separate points for decreasing the length of hauls.

5. Of the sixteen technical stations that exist on the line in nine of them useful length of receiving-departure tracks is 850 m. This, in turn, reduces the weight of trains and leads to a «fracture» of the weight of trains and rehandling of a train on technical stations, underutilization of locomotive's capacity, therefore it is appropriate to consider measures to lengthen the station receiving-departure tracks.

6. As already noted, Transmongolian main line is equipped with semi-automatic blocking. With the sharp increase in freight flows, to increase capacity and carrying capacity of sections it is necessary to consider the introduction of full automatic blocking, because in case of using automatic blocking with different packet coefficients, partially packet schedule of trains is applied.

**Keywords:** Transmongolian main line, Ulan Bator railway, freight flow, semi-automatic blocking, automatic blocking, carrying capacity, estimated capacity, technical station, technical modernization.

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Координаты автора (contact information): Мунхдэлгэр Балжир (Munkhdelger Baljir) – munhuu\_mii@mail.ru.

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