Analysis on the Developing Situation of CHINA RAILWAY Express

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Abstract. With the further implementation of the Belt and Road Initiative, the economic trade and exchanges between China and Europe, also including countries along the routes, have developed rapidly, resulting in a growing demand for the logistics. In this context, CR Express is developed. However, its rapid growth highlights many problems. In this paper, the current operating situation of CR Express is analyzed firstly, including the quantity, area of operation and type of goods. Then, analysis on the main problems of the operation is carried out from different aspects, especially the organization of goods source, loading technologies of container and facilities and equipment. Finally, concrete countermeasures are put forward to improve the operation of CR Express.

1. Introduction

CHINA RAILWAY Express (CR Express), belonging to the international railway through transport container trains, runs among China, Europe and other countries along the routes of the Belt and Road, and is operated in accordance with fixed train number, routes, schedules and full runtime [1]. It has been eight years since CR Express was firstly operated in 2011. As a result, not only breakthroughs in the scale, coverage and goods category of the operation are achieved, but also a relatively clear mode and stable pattern of operation are formed [2]. It is of great practical significance to analyze its current development situation and main problems in order to promote its orderly development [3].

2. Analysis of Operating Situation

2.1. Number of Operating Trains

Since it was operated in 2011, CR Express has grown rapidly in the scale and quantity [3]. As seen in Fig. 1, from 2011 to 2016, 17 trains, 42 trains, 80 trains, 308 trains, 815 trains, and 1702 trains were operated respectively. With the advent of 2017, CR Express had achieved a massive surge, operating 3673 trains in the whole year with a year-on-year growth of 116%. This number exceeded the total number of trains from 2011 to 2016. In 2018, CR Express kept a rapid momentum of growth, operating 6300 trains in the whole year with a year-on-year growth of 72% [4].

Actually, at the beginning of the operation, full loaded CR Express to Europe could only have fewer goods on its trip back. However, since 2014, the situation of return trains with goods has been greatly improved. As shown in Fig. 2, the number of return trains, operating from 2014 to 2018, was 28, 265,
572,1274 and 2,690 respectively [5]. From these figures, the proportion of return trains in the total operation could be calculated which was 9%, 33%, 34%, 35% and 43%. Obviously, a significant increase could be observed in 2018.

![Figure 1. Total number of CR Express](image1)

![Figure 2. Departing and return trains of CR Express](image2)

2.2. Operating Area

By December 12th, 2018, CR Express has reached 56 cities in China and 49 cities in 15 European countries [6]. It covers not only major provinces and regions in China, but also major countries and cities in Europe. At present, 15 domestic cities have entered into stable operation, including Chengdu, Chongqing, Zhengzhou, Wuhan, Suzhou, Yiwu, Changsha, Xi’an, Yingkou, Dalian, Shenyang, Harbin, Urumqi, Hefei, Guangzhou. Considering the cumulative trains of CR Express in these major cities, Chengdu, Chongqing, Zhengzhou and Wuhan are in the forefront of the country. The following description takes these four cities as examples to analyze the proportion of the operating area in the whole country.

As shown in Table 1, the total number of CR Express including the four cities of Chengdu, Chongqing, Zhengzhou and Wuhan accounted for 79.2%, 64.8% and 66.63% of the whole country respectively in 2016, 2017 and 2018.
From 2011-2018, the total number of operating trains in the whole country was 12,937. Refer to the above mentioned cities, their corresponding cumulative number of operating trains were 3000 in Chengdu, 2630 in Chongqing, 1689 in Zhengzhou and 1,200 in Wuhan. So, the total number of trains in these four cities was 8519, accounting for 65.8% of the national total.

It can be seen that the number of trains in Chengdu, Chongqing, Zhengzhou and Wuhan has always accounted for about two-thirds of the national total, whether the calculation is related to annual or total data or not.

Table 1. The number and proportion of the operating trains in major cities

| Year | Total number of trains | Chengdu | Chongqing | Zhengzhou | Wuhan | Number of trains in 4 cities |
|------|------------------------|---------|-----------|------------|-------|-----------------------------|
| 2016 | 1702                   | 448     | 420       | 246        | 234   | 1348                        |
|      |                        | 26.30%  | 24.70%    | 14.50%     | 13.70%| 79.20%                      |
| 2017 | 3673                   | 858     | 651       | 492        | 379   | 2380                        |
|      |                        | 23.40%  | 17.70%    | 13.40%     | 10.30%| 64.80%                      |
| 2018 | 6300                   | 1587    | 1442      | 752        | 417   | 4198                        |
|      |                        | 25.19%  | 22.89%    | 11.94%     | 6.62% | 66.63%                      |

2.3. Type of Goods
At the initial stage of CR Express operation, processed and manufactured products, such as mobile phones, computers and other IT products, were of the majority. With the increasing of operating number, the type of goods transported by CR Express has gradually become more diversity. For the departing trains, the categories of goods have expanded from single IT products to clothes, shoes and hats, auto parts, food, wine, coffee beans, wood, furniture, chemicals, small commodities, mechanical equipment and other categories. For the returning trains, stable source of goods has been established, like auto parts, mechanical equipment, daily necessities, food, wood and etc. [4]. As a result, the operation of CR Express can promote the import and export trade between China and Europe, through transporting almost all kinds of commodities.

3. Analysis of Existing Problems
There are still some problems during the rapid development of CR Express. In order to analyze and summarize the main problems, three aspects, including organization of goods source, technical standards for safety cargo loading, and the facilities and equipment of railway, are introduced in the following part.

3.1. Unreasonable Organization of Goods Source
Unreasonable organization of goods source could be observed in two aspects.

One aspect is the inappropriate attracting area of goods source. In order to ensure the operation of CR Express, local governments keep promulgating related subsidy programs [7]. With the support of government subsidies, operation companies of various regions push out various preferential measures to scramble for enough goods source. As a result, their hinterlands of goods source continuously extend, leading to a lower proportion of local goods source. Taking CR Express in a certain city in central China as an example, the goods source mainly comes from the native province, east China, south China, southeast China and other regions, which account for 18.36%, 40.82%, and 31.02%, 7.34% and 2.46% respectively. The service area of CR Express is shown in Fig. 3.
The other aspect is the uneven distribution of operating trains. Since the operation of CR Express, the number of trains in Chengdu, Chongqing, Zhengzhou and Wuhan always accounts for about two-thirds of the national total. In other words, the total number of trains in the remaining around 50 cities only accounts for about 30%. The number of overall trains has increased rapidly these years. However, a large number of trains are concentrated in a few cities, while many other cities just follow blindly to operate trains, regardless of the source of goods and the costs.

3.2. Inconsistent Technical Standard for Cargo Loading
China Railways lack specifically technical standards for the safety of container cargo loading. At present, the safety requirements for container cargo from the railway department are mainly in accordance with two rules, one is the "Loading and Reinforcing Rules of Railway Cargo", and the other is the “Transportation Rules of Railway Container”. However, these two rules do not involve in specific requirements for loading and reinforcing for container cargo. Under this circumstance, local railway administrations have established their own regulations in line with the actual situation, according to the above two rules. Due to the numerous type goods that can be packed into containers, the regulations and methods adopted by each railway administrations and related stations to determine the reinforcing project for loading goods in containers are not in complete accord.

CR Express involves in international combined transport or multimodal transport. Thus, different rules and standards are adopted due to different transport modes and areas. These involved rules and standards include related rules of domestic railway, related standards of shipping logistics and relative international standards. However, all of them have different terms about technical conditions and degree of details for loading goods in containers. Also due to the lack of uniform technical standards, practices vary in the actual operation. As a result, these reasons make it easy to cause security issues under different requirements.

3.3. Insufficient Capacity of Facilities and Equipment
Insufficient capacity of facilities and equipment also could be observed in two aspects.

One aspect is the insufficient reloading capacity of railway port stations. At present, the port stations of Alas Hankou, Manhole and Erenhot all have been operated at full capacity. With the rapid economic growth of China and neighboring countries, such as Russia, Kazakhstan and Mongolia, and the quick development of the logistics corridor of CR Express, there will be a bottleneck in the transportation of China border railway ports. In comparison, the reloading capacity of neighboring port stations, such as Dostyk station and Post-Baikal station, are much weaker than that of China border railway ports. Due to the insufficient reloading capacity, goods are overstocked and the stations are congested, which could affect the on-time rate of trains. Furthermore, this insufficiency could increase the transportation cost of customers and restrict the development of the logistics corridor of China-Europe.
The other aspect is the imperfect supporting facilities and functions of the station. In China, certain gaps still exist in terms of logistics, customs, inspecting facilities and equipment as well as the requirements of constructing quick logistics ports for the main continental ports, including Alashankou, Horgos, Manzhouli, Suifenhe and so on [8]. Firstly, the existing railway container center stations and ports are short of supporting service functions; secondly, the site area of customs supervision is insufficient; finally, the inspecting equipment for imported goods is not perfect enough to meet the needs of massive distribution. In 2018, with the increasing of CR Express, the exit ports suffer from congestion (especially Erlian port, the congestion time can be as long as 7-10 days), and the average operation time is as long as 24 days, comparing to 17 days in 2015. Due to the decline of efficiency, railway transportation would lose its advantages, resulting that more and more goods are transported by sea.

4. Suggestion

4.1. Optimizing the Organization of Goods Source
With the rapid development of CR Express, various regions are competing to operate CR Express trains, and try to introduce different preferential policies to attract goods that are not local, resulting in their unreasonable flow. Many of the trains have much lower operating frequency because of lacking enough goods source. In response to this phenomenon, we should study the reasonable range for attracting the goods source. Also we need to design and build a regional gathering center. When organizing the transport of CR Express, we should first subdivide the goods, and study the characteristics of various types of goods. In order to lay the foundation for operation, we should confirm which one is the stable source for CR Express and should be given priority. Secondly, different organizational models and service mechanisms should be adopted for different types of sources to ensure the safety of the goods flow organization, reduce the damage and realize the efficient and smooth flow of goods.

4.2. Establishing a Standard System for Container Goods Safety
In order to ensure the safety of goods transport between China and Europe, the technical conditions of loading and reinforcing goods for railway container should be further discussed. Firstly, through theoretical research and field trial operation, the loading and reinforcing projects and technical requirements for different types of goods should be established, and then being the standard of China railway. Secondly, in order to solve the problem that the trains need to go through several times of reloading and inspecting in the whole transport process, the relevant departments should establish a standard system for the safety precaution of goods in the whole container transportation. The standard system shall also include common standards and requirements for the safety control, safety inspection and risk prevention of container goods, running through the whole transport process from the loading to the final delivering of the containers. Based these, we can build a safety precaution standard system for all employees in the whole process to obey, such as shippers, agents, transportation companies, and customs inspections.

4.3. Strengthening the Construction of Infrastructure
At present, the infrastructure of field stations and port stations at home and abroad are not perfect and short of some functions, which have affected the operating ability and convenience in these stations. So the construction of infrastructure and the improvement of its functions in railway stations should be strengthened. It is necessary to analyze or estimate the capacity of infrastructure in railway container stations and railway frontier stations. Then plans for expanding scale or putting in more facilities and equipment should be formulated to improve the port functions of railway stations and the ability of foreign field stations. In addition, for railways in Central Asia, Russia and Mongolia, upgrading can be accelerated through financial and technical assistance.
5. Conclusion
Looking forward to the future, the operation of CR Express will strive to optimize the layout of the operation, strengthen infrastructure and ensure security, in order to develop a higher quality. At the same time, the functions of CR Express will expand from a single economical channel to comprehensive industrial layout and industrial chain. Thus, that it will play a greater role in promoting the interconnection of countries along the Belt and Road and become an important bridge in international trade.

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