Research on The Shared Logistics Operation Mode based on New Intelligent Container

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Abstract. China's domestic trade container transport has the characteristics of large cargo weight and complex cargo category. At the same time, it is difficult to pack bulk cargo, easy to expand the container, large difference between damaged and damaged goods, and high labor, machinery and time costs. Through extensive analysis and experimentation, intelligent container for rapid transshipment adapted to multi-modal transport has been designed to solve this problem. With the container as the carrier, using the Internet, big data analysis and other new technical means, the concept of shared container is proposed for the first time, the functional architecture of the shared container platform is designed, and the intelligent shared logistics operation mode adapted to the development of domestic trade transportation in China is proposed. This mode will break through the traditional operation mode of "booking containers by ship" in the shipping industry and innovate the new circulation mode of bulk commodities such as steel.

Key words: multi-modal transport; container; intelligent; sharing

1. Introduction

China is a major country in container transportation and equipment production in the world, with container transportation and production ranking first in the world.[1] Container transportation has become the main mode of standardized transportation of goods in China. The diversified and precise development of modern logistics has put forward higher requirements for container transport and the diversification of container specifications. In order to meet the development needs of diversified logistics, the proportion of special cargo container transport in the whole container transport is increasing. Many new types of products have emerged, such as open-top boxes for bulk cargo transportation such as coal, and rack boxes for large cargo transportation such as engines. The development of "bulk reform" transportation puts forward new requirements for the production process and loading and unloading process of containers. It is objectively necessary to improve the strength structure and loading and unloading methods of containers in order to facilitate the transportation operation. [2] In this paper an intelligent container for rapid transshipment adapted to multi-modal transport has been designed to solve this problem, and the intelligent shared logistics operation mode is proposed.

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2. The shortcomings of ordinary international standard container in China's domestic trade transportation

At present, China's domestic trade container transport cargo mainly includes coal, mining and construction materials and other bulk cargo transportation, which has the characteristics of large cargo weight and huge cargo category. [3] In recent years, with the development of China's "bulk reform" business, corn, coal and many other bulk materials are loaded into ordinary international standard containers for transportation. General international standard containers were mainly used to load bulk cargoes when they were born, and the function of loading bulk cargoes was not considered at the beginning of design. Therefore, the common international standard containers in China's domestic trade container transportation are faced with such problems as easy expansion, large damage to the containers, more loading and unloading steps, high labor and mechanical costs, and inappropriate packing of rebar, coiled plate, liquid bag and other goods. [4-5] At the same time, in highway and railway transportation, there are also problems such as weight limitation leading to loss of tons, frequent empty container transfer and high transfer cost.

3. New intelligent container design

3.1 Technical parameters

In order to explore the best container type suitable for the characteristics of domestic trade transport in China, a large number of analyses and tests have been carried out. The research team designed an intelligent 40-foot half-height hard open-top heavy-load container ("half-height container" for short) that is suitable for the characteristics of domestic trade and the development of multi-modal transport in China. [6] This kind of containers is designed with octagonal column, with length, width and height of 12.192 meters 2.438 meters 1.7171 meters, with a total weight of 40.5 tons and a maximum load of 37 tons. The upper part is double open hardtop, while retaining the door, and equipped with Beidou positioning system. The model of the half-height containers is shown in Figure1. Technical parameters of an intelligent 40-foot half-height hard open-top heavy-load container are shown in Table 1.

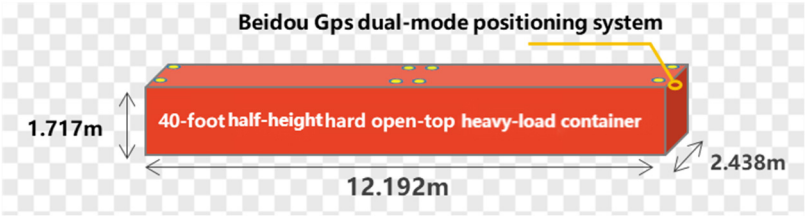

Figure 1. A model of a intelligent 40-foot half-height hard open-top heavy-load container

Table 1. Technical parameters of an intelligent 40-foot half-height hard open-top heavy-load container

Size			Load and volume	
Out of the box	length	12.192 m	Upper opening size	5.7 * 2.1 m
	width	2.438 m	Internal volume	41.94 m^3
	height	1.717 m	Own weight	3.5 T
Inside the box	length	12.020 m	Total weight	40.5 T
	width	2.352 m	Top cover weight	2 * 0.15 T
	height	1.482 m	Maximum load	37 T

3.2 Advantages characteristics

The half-height container has the advantages of strong heavy-load capacity, more cargo adaptability, convenient and efficient loading and unloading, high compatibility and versatility, and intelligent visual tracking. This kind of container meets the loading standards of China's highway, sea and railway, and can be widely used for cargo packing and transportation. The door-to-door transportation of combined transportation of sea, rail, sea and land, and river and sea can make many bulk and miscellaneous goods that are not suitable for packing in the past realize "bulk reform". At the same time, it can improve supply efficiency, reduce logistics costs, and realize real multi-modal transport.

- Strong heavy-load capacity

Ordinary 40-foot international standard container is easy to deform when lifting by heavy load, and the heavy load can not be effectively played. The half-height container is designed with octagonal column, which has large bearing capacity and high strength, which can ensure that the middle container does not deform during heavy load, and the container structure is safer.

- More suitable for goods

The half-height container can be used for both extra-long, solid and bulk goods, and all kinds of steel, grain, mineral powder, coal, etc. It can expand the types of container transport and promote "bulk reform" transport.

- High compatibility and versatility

The length and width of the half-height container is the same as that of the ordinary international standard container, and the height of the three half-height containers is the same as that of the two ordinary international standard containers. The height comparison between half-height container and international container is shown in Figure 2. In the sea transportation, there is no need to change the existing standard changing tools and carrying equipment, and it can be flexibly loaded and transported with the ordinary international standard containers. At the same time, the deadweight of half-height container can meet the maximum weight limit standard of the total mass of road freight vehicles, and make up for the shortage of tons of ordinary international standard containers. In railway transportation, zero load loss can be achieved by double-layer stacking transportation. [7]

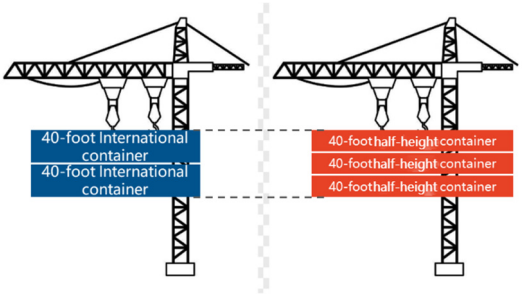

Figure 2. Height comparison between half-height container and international container

- Convenient and efficient loading and unloading

The flexible top opening method of the half-height container facilitates the loading and unloading of bulk goods from the top. It can reduce the use steps of manpower and machinery, and has the advantages of simple loading and unloading, high efficiency and low cost. The disadvantages of the soft top container, such as poor water tightness and unsuitable for carrying high-value goods, can be remedied.

- Intelligent visual tracking

The half-height container is equipped with Beidou positioning system, which has the functions of real-time positioning, track playback, container management and so on. It can realize the visual tracking of containers, and is suitable for door-to-door logistics transportation.

4. Innovation of container shared operation mode

Deeply integrate half-height container technology innovation with "Internet plus" platform service innovation. With the half-height container as the carrier, and by means of the Internet and information technology, we will establish a shared container network platform, turn the concept of sharing into reality, and establish a shared logistics operation mode that is suitable for China's domestic trade transportation. [8]

4.1 Shared container network platform

With half-height container as the technology carrier, "Internet + efficient logistics" as the service innovation means, combined with new technologies such as blockchain, big data and so, integrating Beidou and GPS dual-mode communication, establish a shared container network platform, and realize the flexible shared leasing business of online container booking, free container rental, online settlement and borrowing and return. The function of shared container network platform is shown in Figure 3. Customers can rent, lift and return container through the shared container network platform, and the container owners can accept the order, return the container for approval, container dynamic management, container loss management, positioning query and other operations. At the same time, based on the massive information of the platform, it can provide users with derivative value-added services such as shipping booking, electronic insurance policy, intelligent allocation of empty containers and source analysis through data mining analysis.

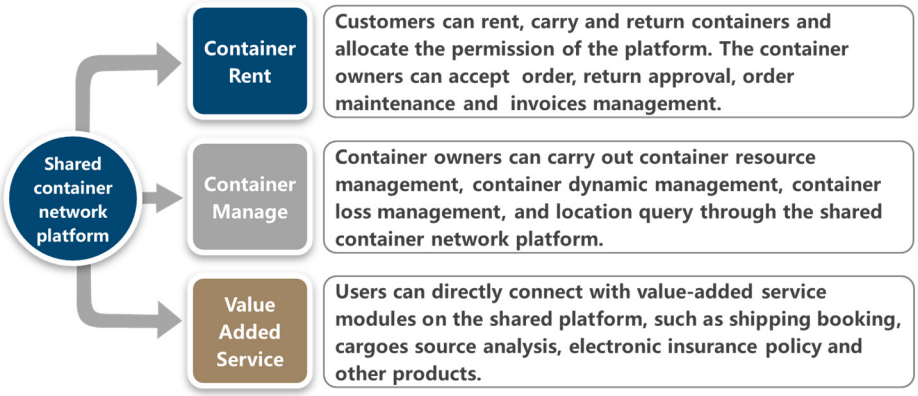

Figure 3. Function of shared container network platform

4.2 New operation mode of "shipping by container"

The combination of half-height container and network platform will break the traditional mode of "booking container by ship" in the shipping industry (users must book the container position of the shipping company as the premise), form a new operation mode of "shipping by container" (users can use container to load goods before determining the transport ship), solve the empty container dispatching frequently, high cost, receiving not timely industry pain points.[9] This mode not only meets the needs of customers for flexible use of containers, but also maximizes the turnover rate of containers, promotes the circulation of goods more convenient and efficient, and reduces the social logistics cost.

4.3 Innovate the logistics mode of bulk commodities such as steel

At present, China's bulk commodities are delivered in the form of futures, with a large purchase volume and many middlemen, forming a multi-level distribution trade chain and a logistics system with multiple distribution stations.[10] The half-height container "bulk reform" mode will break through the original steel and other commodities in the logistics transportation business fragmentation bottleneck, through shared container network platform, realize the cargoes "door to door" a single logistics services, change the shippers and traders original production and marketing mode, shorten the sales chain, for consumers to producers directly create a new channel, effective through steel commodities such as the original logistics system, reduce the intermediate links, optimize the current domestic logistics organization mode, promote the development of multi-modal transport. The steel trade circulation link is shown in Figure 4.

Figure 4. Steel trade circulation link

5. Conclusion

This paper designs an intelligent 40-foot half-height hard open-top heavy-load container that adapts to the characteristics of domestic trade and the development of multi-modal transport in Chin. Relying on the intelligent visual tracking and other characteristics of the container, and combining with the new generation of information technology, we will build a shared container network platform based on mobile intelligent terminal technology, realize the flexible shared leasing business on the container line, and innovate the intelligent shared logistics operation mode adapted to China's domestic trade transportation. In the future, we will further promote the market application scope of half-height containers, deeply explore the economic and social benefits of half-height containers, and explore the possible changes in the operation mode by improving the functions of the shared container platform.

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