

Analysis of the Current Situation in the Development of Lithium Battery-powered Vehicles for Sea-rail Transport " One-container Operation "

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Abstract: In the new energy vehicle market, Shanghai's leading position in terms of export volume among the Yangtze River Delta region is evident. Owing to the restricted carrying capacity of roll-on/roll-off (RoRo) vessels for automobiles, the need for containerized shipping methods for the export of Lithium battery-powered vehicles. has become pressing. In response to the aforementioned situation, since the release of the "Opinions on Accelerating the Development of the Integrated Transport System with 'One Document, One Container'" earlier this year, the government have innovatively organized remote containerization services and provided guidance on maritime dangerous goods containerization for Lithium battery-powered vehicles. at the railway originating stations. A green channel has been established for the declaration of maritime dangerous goods for this batch of goods, while efforts have also been intensified to enhance coordination at various stages, including railway transportation, unloading at the destination, and short-haul transportation to the port. This article aims to elaborate on the various aspects of this measure and provide an analysis of its development.

Keywords: Intermodalism; One Container Operation; Lithium Battery-powered Vehicles.

1. The Capacity Constraints in Roll-on/roll-off (RoRo) Transportation

In recent years, there has been significant demand for exporting Lithium battery-powered vehicles. During 2022, Shanghai Port processed 2.82 million units of roll-on/roll-off (RoRo) vehicles, a YoY increase of 45%. Of the overall total, 1.8067 million units were exported, indicating a 64.2% increase from the previous year. Within the exported vehicles category, 1.3702 million units of specifically RoRo vehicles were sold in international markets, showing a 55.2% year-on-year growth. A total of 26,340 RoRo vehicles were imported via the port for the entire year, indicating a 25.8% decrease from the last. There were 750,000 RoRo vehicle units imported domestically, with an increase of 52.9% compared to the previous year, and 436,500 domestically exported RoRo vehicle units, indicating a 101% growth.

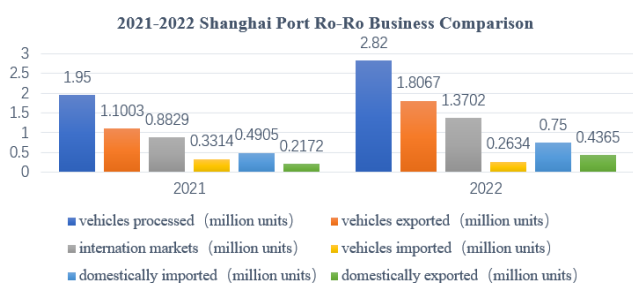


Figure 1. 2021-2022 Shanghai Port Ro-Ro Business Comparison

According to recent Shanghai Customs statistics, Shanghai Port witnessed the export of 1.022 million vehicles from January to July 2023. This marks a year-on-year increase of 54.8%, leading all ports in China. Notably, the Haitong Terminal situated in the Waigaoqiao Port zone is the departure point for nearly 2 to 3 RoRo vessels on a daily basis. The

Nangang Terminal, situated in the Lingang New Area, is making efforts to manage RoRo vessel operations, wherein 80% of the exports comprise of Lithium battery-powered vehicles.. As figure 1 shows, with a continuous surge in the number of vehicle exports via the Shanghai Port, the transport capacity for RoRo vessels is progressively becoming restricted. The scarcity of RoRo ship berths and parking spaces is increasing, resulting in an urgent requirement for novel transportation channels to export Lithium battery-powered vehicles. in the country's industry.

2. Specialties of Lithium battery-powered Vehicles.

2.1. Lithium Battery-powered Vehicles. are Dangerous during Transport

Sea-rail transport is a recent development whereby goods are loaded into containers, transported by rail to seaports, and then shipped by ocean vessels. This method has been commonly applied to various cargo types, although Lithium battery-powered vehicles. exhibit distinct features. The lithium batteries in these vehicles are potentially hazardous when confined in containers due to their instability. Fire and explosion incidents involving lithium batteries exhibit rapid ignition, produce toxic gases, and present greater challenges for extinguishing when compared to other products. Such incidents may result in significant damage to both persons and property. As per the International Maritime Organization's IMDG Code, Lithium battery-powered vehicles. transported by sea are categorized as Class 9 dangerous goods.

2.2. Inadequate Proficiency among Carriers or Container Operators in Packaging and Transporting New Energy Automobiles.

The requirements for loading Lithium battery-powered

vehicles. in maritime settings mainly comprise the relevant provisions of the International Maritime Dangerous Goods Code and the Safety Technical Requirements for Maritime Container Loading of Dangerous Goods (GB 40163-2021). These are the standard requirements for loading dangerous goods. However, the process of storing vehicles in containers and securing them by lashing and fastening techniques differs significantly from that of transporting hazardous materials. Transport bracket load capacity, strength of lashing, and the method of fastening vehicles are all crucial for ensuring transport safety. Unfortunately, due to the absence of explicit technical regulations, traders are uncertain about the precise criteria for loading vehicles. The absence of distinct technical guidelines has left shippers uncertain about the precise loading standards for vehicles, whilst container loading inspectors face difficulties in evaluating whether loading quality meets the necessary criteria. These concerns have resulted in significant security risks for the transportation of Lithium battery-powered vehicles. via sea containers.

2.3. Multiple Inspection Requirements for Containerized Transport of Lithium Battery-Powered Vehicles

Previously, companies have attempted to export Lithium battery-powered vehicles. through the sea-rail transportation method. However, after the cars are transported by rail to Shanghai, they must undergo inspection at specialized dangerous goods containerization facilities within Shanghai Port. Subsequently, they need to be reloaded and labelled according to the standards for the transportation of dangerous goods by sea. The containerization process is overseen and verified by maritime authorities who then issue electronic documents permitting entry of containers into the port. Although this secondary containerization process may lead to delays in the scheduled departure of vessels, it also inevitably raises the operational and time costs for companies involved.

3. The Meaning of the "One-container Operation"

Multimodal transport offers benefits stemming from its lengthy industrial chain, comprehensive resource utilization, and general efficiency, all of which make it an effective strategy to encourage lower costs and better performance in logistics. Nonetheless, several drawbacks still hinder this method, including the requirement for second-layer containerization and multiple inspections, resulting in significant delays in transportation.

"One-container operation" is a new model which is suggested as a response to the institutional and systemic expenses linked to intermodal transportation in China. This innovative model is characterized by the elimination of container exchange and cargo unpacking throughout the entire journey while transferring containers between various modes of transportation, resulting in the principle of "one container until the end." The principle of "no container exchange" necessitates ensuring the compatibility of containers amidst varying transportation modes. Additionally, the transfer process should only involve lifting the container unit without any need to unpack or exchange the cargo contained within it. The "no cargo unpacking throughout the entire journey" principle ensures that cargo inspections only occur at the origin and destination, thereby eliminating the necessity of further inspections during transit.

4. Application of the " One-container operation " to the Transport of Lithium Battery-powered Vehicles.

To simplify the intricate process of transporting hazardous items, a possible approach would be relocating the monitoring and compliance centers to the train terminals. In August 2023, Wuxi West Station railway cargo yard introduced external containerization services with the assistance of Shanghai Maritime Safety Administration. Guidance was provided for the containerization of a batch of Lithium battery-powered vehicles. as dangerous goods for sea transport. Strict compliance with international standards was ensured, and electronic documentation was promptly issued. This established a green channel for the transportation process, seamlessly connecting the batch of goods to the declaration of dangerous goods for sea transport upon arrival at the seaport. This method facilitated the prompt allocation of a containerization site for hazardous materials, early supply of safety monitoring services for containerization, and swift handling of declaration approvals.

Subsequently, the containers were loaded onto container ships docked at Yangshan Port and transported to the intended Guatemalan port. It is estimated that the transportation approach curtailed transit time by 2-3 days and decreased expenses by 15%. Several new energy vehicle companies and port groups from various locations have also participated in "one-container operation" sea-rail transportation.

5. Analysis of the Prospects for the " one-container Operation "

5.1. A Highly Efficient Approach for Reducing Costs and Enhancing Efficiency in Logistics

The aim of the development of multimodal transport, specifically the "one document system" and "one container operation," is to promote the expansion and quality of multimodal transport. This objective can be achieved through the promotion of standardized documents, enhancing information and data interoperability, expanding document services, and cultivating backbone multimodal transport operators, alongside other policy measures. The goal is to further unleash the role of multimodal transport in reducing costs, increasing efficiency, and effectively contributing to the construction of a modern circulation system, ultimately promoting cost-effectiveness in logistics.

5.2. Important Support for Services to Build a New Development Pattern

The establishment of multimodal transport and the utilization of the "one-container operation" are imperative for creating a new development model. The latter denotes an innovative form of multimodal transport. By expediting its progress, we can maximize the linking role of multimodal transport in bolstering the establishment of a modern industrial system. It is highly significant to expand China's institutional opening-up, explore novel regulations for transportation and commerce within the Belt and Road Initiative, and establish a multimodal transportation service system that is both globally competitive and influential. With transportation capacity limited for Lithium battery-powered vehicles. and roll-on/roll-off transport, the stated

transportation system offers an appreciable improvement in speed and convenience, lowering costs for China's import and export trade.

Globally, the trend is shifting towards "one-container operation." In Europe and America, certain developed countries have adopted different container transportation systems for domestic and international trade. ISO standard containers are chiefly used for international trade, whilst domestic trade adheres to containers conforming to continental standards. Recently, some operators have implemented domestic container international intermodal services in response to the tightening of transport capacity resources and market segmentation. They have advocated the use of the "one-container operation" concept in container transportation.

6. Current Deficiencies of the "One-container Operation"

Despite initial strides in the development of "one-container operation," several issues persist, including limited data and information sharing, restricted service product availability, inadequate institutional rule coordination, insufficient guarantee mechanisms, and inadequate cultivation of operating entities. Moreover, safe transportation and emergency measures for lithium-ion batteries in the transportation of Lithium battery-powered vehicles. require further advancements. In international commerce, various nations utilize dissimilar examination procedures for lithium batteries. Consequently, it is essential to encourage information sharing in multimodal shipping, modernize the usage of global multimodal transportation paperwork, establish a robust "one-container operation" service arrangement, actively nurture multimodal transportation operators, and refine standard guidelines in multimodal transportation.

It is imperative to expedite the dissemination and integration of data in multimodal transport, back the advancement of merged information services in multimodal transport, standardize the usage of electronic multimodal transport documents, urge corporations to make their data and interfaces accessible for multimodal transport, unify and consolidate information from various transport means, and implement standardized business process refinements.

Solving the challenge of interconnecting and sharing multimodal transport information is crucial. Removing the barriers to access multimodal transport information represents an essential step towards promoting electronic documents for multimodal transport and achieving efficient document information flow. This can be done by supporting the development of integration services for multimodal transport information, promoting the use of standardized electronic waybills, encouraging enterprises to open their transport data and interfaces, and consolidating the information and data from various transportation modes. Additionally, standardized business processes should be transformed to achieve this goal. It is imperative to promote the advancement and expansion of the "one document system" service function of multimodal transport in a neutral and factual manner. Concerned departments must rely on documents like the international railway intermodal transport waybill and China International Freight Forwarders Association multimodal transport bill of lading to investigate the development of the railway-based multimodal transport

documentation material rights. These multimodal transport documents should provide a voucher function for material rights. At the same time, the national government affairs data-sharing mechanism should be used to enhance data sharing among the transport, commerce, customs, and other relevant departments. Additionally, the "one document system" customs clearance supervision for multimodal transport must be optimized.

7. Methods to Improve the Coverage of "One Container Operation" Applications

Currently, the use of sea-rail intermodal transport employing the "one container operation" is not prevalent. Instead, numerous carriers and logistics firms continue to embrace the conventional manner of employing a single mode of transportation for shipping. In multimodal transportation, the benefits of the "one container operation" and "one document system" are not particularly notable. As a result, several aspects can be modified to augment the applicability and coverage of this system.

7.1. Enhance the Collaboration Process of "Non-Exchange of Containers during Transit".

Facilitate the creation of port container return points at railway depots, deliver inland container management services, and stimulate the advancement of sea-rail intermodal container transportation. Accelerating the construction of railway return points and backhaul transport organization system overseas and promoting the launch of railway containers in accordance with both international and national standards. A pilot program will be initiated to promote the establishment of a 35-tonne wide-bodied container as the carrier for domestic rail and water intermodal transport systems. Encourage railway and shipping companies to establish containerization for cooperative mechanisms and to promote the recycling of containers through joint allocation. Accelerate the development of specialized leasing markets for containers, semi-trailers, and pallets.

7.2. Enhance the Administration of the "No-opening" Procedure.

Refine and improve the standards for multimodal cargo handling relating to containers, expedite the smart design and alteration of container depots, and streamline the process of exchanging containers, including container inspections, to enhance efficiency. Promotion of radio frequency identification, two-dimensional codes, satellite positioning, and other container online tracking technologies is necessary. Support should be offered to eligible enterprises in developing their container transport data platforms for enhancing intelligent tracking, as well as the overall management, throughout the multimodal container transport process.

7.3. Guide Multimodal Transport-Related Businesses to Enhance Coordination and Collaboration.

Encourage multimodal transport operators, rail transport, road transport, waterway transport, freight forwarding companies, and financial institutions to strengthen their

cooperation. Establish and improve organizational processes for multimodal transport businesses, transport safety management and other recognized and trusted systems and standards for all involved parties. The promotion of a technical assistance platform for blockchain bills of lading is endorsed, with the aim of enhancing information exchange, business partnerships, and resource distribution among multimodal transport businesses. Utilizing blockchain technology facilitates such initiatives.

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