

New Trends of Jianghai Intermodal Route Based on Grey Correlation Method

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Abstract. Zhoushan New District is located at the intersection of the Yangtze River Delta and the Pearl River Delta on the southeast coast of China. The Yangtze River Delta region, which is backed by the eastern coastal economic belt and the “T” type of the Yangtze River Economic Belt. The important area of the coastal area and the Yangtze River basin that goes to the Pacific Ocean is Zhoushan. The important transportation hubs of Northeast Asia and the Western Pacific are composed of important ports such as Busan, Nagasaki, Kaohsiung, Hong Kong and Singapore. To clearly demonstrate the comprehensive advantages of the location, shoreline and shipping of the boat, to achieve this goal, we must optimize the route from the perspective of the country and be proposed by General Manager Li Keqiang.

Significance of Optimization of Zhoushan River-Sea Combined Transport Route

Although there are many topics surrounding the research on river-and-sea transport, most of the research is carried out on container transport, or on the links and elements of river-sea transport. However, Jianghai Intermodal Transportation is an important form of transportation that comprehensively utilizes the connection of Jianghai transportation tools, and facilitates the transportation of goods conveniently, economically and quickly. It involves the design of ship type, navigation channel layout, information platform, policies and regulations, etc. Intermodal transportation is a complex system engineering. It is one-sided to discuss or study from a certain aspect, and it lacks certain scientificity [2]. Moreover, Zhoushan has its uniqueness in terms of docks, navigation channels, cargo handling, etc. The existing research results may not be applicable to Zhoushan. From the existing literature, the research literature specifically for the Zhoushan and Yangtze Rivers combined with the Yangtze River has hardly been produced. From this point of view, it is necessary to carry out systematic research on the combined river and sea transportation in combination with the Zhoushan and Yangtze River navigation channels, traffic flow, and cargo types.

Promote the Optimization of the Whole Route System

For the development of Zhoushan Jianghai Intermodal Transportation, the most important thing is to do the route optimization. This topic intends to use the grey correlation theory to carry out evaluation research on the optimization of Zhoushan River-Sea combined transport route, explore the scientific path of Zhoushan river-sea transport development, and provide decision-making basis for relevant departments. The route optimization of Zhoushan's river-sea combined transport is realized according to the idea of grey correlation theory. Zhoushan can carry out dozens of routes for river-sea combined transport, but the route with shorter voyage and safe navigation is the best route. Studying the routes and development countermeasures suitable for the Zhoushan River-Sea combined transport is based on the large-scale investigation of the operational benefit data and safety index of each Jianghai-intermodal route, using gray theory to evaluate each route and theoretical analysis.

The grey system theory is the main way to study some problems with clear information, some unclear information and uncertain phenomena. The theory is a new one in the early 1980s under the joint influence of cybernetics, information theory and system theory. The theoretical discipline was

established. It is characterized by the fact that some systems are known, some information is unknown, and systems with uncertainties can still be quantitatively analyzed. Each route operation benefit system, each ship type ship operation benefit system, and different policy operation benefit systems are each a gray system, and the factors affecting efficiency are the influence factors of the gray system. The principle of the above theory is as follows: Let $x_0(t)(t=1,2,\dots,m)$ be a reference sequence (also called a parent sequence), $x_i(t)(t=1,2,\dots,m;i=1,2, \dots,n)$ represents n comparison factor sequences (also called subsequences). The degree of association between this subsequence and this parent sequence is related to whether the dimensions of all sequences are identical. To study the direct problems of subsequences and parent sequences, they must satisfy their dimensions. When the equivalents are different, you need to turn them into dimensionless sequences. The first step is to initialize each sequence (that is, each sequence removes all other variable values with the first variable value). A set of dimensionless sequences is thus constructed. which is

$$y_i(t) = \frac{x_i(t)}{x_i(1)} \quad (1)$$

In the above formula: $i = 0, 1, 2, 3, \dots, n$; $t = 1, 2, 3, \dots, m$. The correlation coefficient $\xi_i(k)$ of $x_i(t)$ versus $x_0(t)$ at $t=k$ is determined by:

$$\xi_i(k) = \frac{\Delta(\min) + \rho\Delta(\max)}{\Delta_i(k) + \rho\Delta(\max)} = \frac{\min_i \min_k |x_0(k) - x_i(k)| + \rho \min_i \min_k |x_0(k) - x_i(k)|}{|x_0(k) - x_i(k)| + \rho \min_i \min_k |x_0(k) - x_i(k)|} \quad (2)$$

In formula (2): ρ is called the resolution coefficient, $0 < \rho < 1$, and usually takes $\rho = 0.5$. $\Delta(\min) = \min_i \min_k |x_0(k) - x_i(k)|$ It is called the two-level (two levels) minimum difference. $\Delta_i(\min) = \min_k |x_0(k) - x_i(k)|$ The first level minimum difference refers to the smallest one selected $|x_0(k) - x_i(k)|$ by the different k values in the absolute difference. The second-order minimum difference $\Delta_i(\min) = \min_i [\Delta_i(\min)]$ is the smallest one of $\Delta_i(\min) = \min_i [\Delta_i(\min)]$ selected. Similarly, you can define two levels of maximum difference $\Delta(\max) = \max_i \max_k |x_0(k) - x_i(k)|$ in. Then the degree of association r_i of the subsequence $x_i(t)$ to the parent sequence $x_0(t)$ is:

$r_i = \frac{1}{m} \sum_{k=1}^m \xi_i(k)$ Comparing r_i with $r_j(i \neq j)$, if $r_i > r_j$, it indicates that the i -th factor has a greater impact on the result than the j -th factor.

Looking for the “Zhoushan Standard” for the Jianghai Route

Zhoushan's History and Culture

Zhoushan New District is strategically located at the intersection of the coastline of eastern China and the mouth of the Yangtze River. During the Qin Dynasty, Zhoushan was now called the starting point of Xu Fudong's crossing to Japan. During the Tang and Song Dynasties, Zhoushan was once known as the starting point of Mingzhou Port, one of the four major ports of China's foreign trade. The embassies from South Korea and Japan who came to China will pass through Zhoushan. In the Ming Dynasty, Liuheng and Shuangyu Port and Japan's Changzhi and India could be called "Shanghai in the 16th Century" [3].

Numerous port areas and many different depths and lengths are owned by Zhoushan, which facilitates the free navigation of all kinds of ships. As far as Zhoushan Port is concerned, there are dozens of routes that can be used by ships above 10,000 tons for Zhoushan Port. The depth of water is also stable. The facilities on the main routes are also relatively sound, which will help the construction of Zhoushan Port. Comprehensive development and safe navigation of large ships. The navigation channel of Zhoushan is divided into the following navigation channels. The first is the

Eastern Channel. It is from the head water channel to the shrimp gate and finally leads to the East China Sea. The shallowest waters are about 18 meters, the smallest ones are about 747 meters wide, and the water depth can reach 22 meters when the tide rises. It can accommodate 150,000 tons of ships, and 200,000 tons of ships can also be used during high tide. Entering Hong Kong. If it is slightly managed, the water depth of the channel can reach 23 meters. Then there is the South Channel, which is turned to the south by the screw head waterway, passing through the Tuen Mun Gate, connecting with the coastal ports of Zhejiang and Fujian. The water depth is the shallowest 16 meters, and the 100,000-ton ship can pass easily; secondly, the West Channel, it is from The Jintang Waterway and the West Gate Waterway head west to the Hangzhou Bay and can only be used for vessels of less than 35,000 tons. Finally, the Wushamen Waterway and the Welfare Gate Waterway can pass between 50,000 and 100,000 tons of ships; there are also two waterways on an international route, which are northbound to the Dongting, Langgang, Lushan and Xiaobanmen waterways. Ships with a capacity of 150,000 to 250,000 tons. Although there are so many streets, the main channel is the West Channel and the inner channel. The outer channel, the east channel and the middle channel pass through the vicinity of Zhoushan Port. The water depth is superior. It is the external passage of Zhoushan ship to the Yangtze River estuary and around the world, which can be used for navigation of large ships. Although the ship can also detour from the Yangtze River estuary to the Zhoushan port area via the outer channel, the east channel, and the middle channel, the corresponding voyage is far away and belongs to the non-economic route. From the Yangtze River estuary to Zhujiajian Island, the voyage is calculated to be 80 nautical miles through the Donghai Bridge. It is calculated as 89 nautical miles without going through the voyage of the East China Sea Bridge. It takes 87 nautical miles to go through the voyage of the Tokai Bridge without going through the inner seaway. It is calculated to be 66 nautical miles. It takes 84 nautical miles to go through the Donghai Bridge. It takes 93 nautical miles to go through the Donghai Bridge and 72 nautical miles through the inland river. It takes 53 nautical miles to go through the Tokai Bridge. The island's voyage through the East Sea is only 53 nautical miles.

According to the calculation, the distance from the inner channel of the Yangtze River estuary to the various port areas in Zhoushan is relatively recent, and it is also the most economical route compared to other navigation channels; the routes to the various port areas in the western part of Zhoushan are shorter if they pass the Donghai Bridge. Therefore, if you do not pass the Tokai Bridge, it is far from the Yangtze River estuary to reach the Zhoushan port area without going through the East China Sea Channel.

Comprehensive Analysis of Zhoushan River-Sea Combined Transport

From the "Changjiang Main Line Waterway Development Plan", we can know that: from the Yangtze River estuary to the Liuhe River, it can be navigable to 100,000-ton ships; from Nanjing to Liuhekou, it can be navigable to 50,000-ton ships; while the rest of the Yangtze River can only be used. Ships of less than 8,000 tons are being navigable. Based on a comprehensive analysis of the navigation path, channel depth and channel width conditions of the Zhoushan and the Yangtze River estuary [4], the following conclusions can be drawn: (1) The ship can be selected from the Yangtze River estuary to the east of Danang and Laoshan Port, and it can be selected along the east channel or the middle channel. This channel has excellent water depth and width conditions and can be used for navigation of 100,000-ton ships. (2) Ships of 10,000 tons and below are transported from the Yangtze River estuary to the eastern part of the east of the mountain, the western part of the mountain, the eastern and northern Zhoushan Island, Zhujiajian Island, Taohua Island and Liheng Island. The navigation of the inner channel can be selected; (3) Ships of 8 000 tons and below will travel from the Yangtze River estuary to the west of Lushan Island, Jintang Island and the western part of Zhoushan Island. The West Channel can be selected for navigation. The Donghai Bridge can pass ships of 5,000 tons and below, 5,000. Ships above the tonnage level should choose to take the Jinshan Waterway; (4) Extra-large vessels from the Yangtze River estuary to the various port areas of Zhoushan, the outer channel, the east channel and the middle channel can be selected to sail, and the corresponding voyage is far. From the above analysis, we can easily

see that if there are 50,000-ton ships from Nanjing to Zhoushan, and 100,000-ton ships from Liuhe to Zhoushan, the outer channel and the east channel The middle channel can be selected for navigation; the river and the sea transport ships, but all the waters from the other waters of the Yangtze River to Zhoushan can choose to sail from the west channel. When the west channel of the Jianghai Intermodal Ship is selected for navigation, the voyage is short and belongs to the economic route. Under the premise that the water depth and width of the channel meet the navigation requirements, the West Channel should be selected as much as possible.

Conclusion

At present, the great challenge in the optimization of the specific routes of the Zhoushan River-Sea combined transport is how to combine the technical requirements with the navigation channel, so as to realize the further improvement of the port management departments of the provinces and cities along the river and the importance of the port shoreline management work. And with a professional and efficient management team as a guarantee, so that the shoreline management of the Yangtze River port can be carried out in an orderly manner. The port shoreline management work learning and training is regularly organized and carried out, which makes the port shoreline management work more standardized and systematic, and the port line management level of the provinces and cities along the Yangtze River is improved. To this end, it is necessary to adopt the ecosystem concept, starting from the elements of people, routes and environment, and comprehensively analyzing the impact of the navigation environment, logistics environment, market environment, regulatory environment and policy environment on the route. On this basis, through technological innovation, the route is made. It is more harmonious and harmonious with the various elements of the ecosystem, so that the optimized route is created with greater social and economic value.

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