

Discussion on the Measures to Promote the Development of High-quality Inland Ships

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Abstract: In the 21st century, the inland ships in China have been greatly developed. The large-scale and professional development trends of ships are obvious, and the overall technical level of ships has been greatly improved. However, the quality of ships constructed is still evidently poorer than that of inland ships in Europe, the overall existing ships are not green enough, and the fleet capacity cannot be updated promptly. For the high-quality development of inland ships, this paper recommends the combination of the upgrading of inland ships with adjustment, transformation, and updating of ship industry structure, promoting the high-quality development of inland shipbuilding industry on the supply side, presenting and promoting optimal ship types, and implementing economic policies to encourage the adjustment of the technical-level structures of inland ships.

1 INTRODUCTION

Compared to highway and railway transportation, inland river transportation has the advantages of large capacity, small land area occupied, low energy consumption, environmentally friendliness, and low marginal cost. China has abundant inland river transportation resources. Since the reform and opening up, especially since the 21st century, the inland shipping has developed remarkably, and played an important role in supporting the economic and social development of the river basin. In the future, the high-level inland channels of China will be doubled to 2.5 km. Instructed by the plan of forming an inland channel network connecting rivers to the sea, it is a strategic opportunity to improve the overall quality and technical level of inland ships, to make full use of the channel infrastructure capacity, and to improve the overall benefit of inland river transportation system.

2 OVERVIEW OF CHINA INLAND VESSELS

At the end of 2019, China has 119.5 thousand inland vessels, with a total load of 121 million tons. The inland rivers are widely distributed. The types of

ships are various, and the sizes are relatively small in general. 70% of them are small vessels with a capacity of less than 1000 tons. The economy of ship transportation has an obvious relationship with its capacity. The low-cost advantage of inland river transportation is obvious when the capacity reaches about 1000 tons. Therefore, ships with a capacity of 1000 tons should be the dominant tools of inland river transportation. In China, the sum of capacities of vessels with a capacity of ≥ 1000 tons accounts for about 75% of the total capacity. Therefore, the following sections focus on the analysis of the situations of the inland vessels with a capacity of ≥ 1000 tons in China.

In the year of 2020, 34.3 thousand inland ships with a capacity of ≥ 1000 tons were located in China. The total and average loading capacities were 94.05 million and 2738 tons, and the mean ship age was 9.88 years. The owners of these ships, more than 4800 enterprises and more than 10000 individuals, are relatively scattered.

In terms of the number of ships with a specific capacity, the number of ships with a capacity of < 5500 tons accounts for a large proportion of almost 89%, and the number of ships with a capacity of 1000 to 2000 tons accounts for 56%, that of ships with a capacity of 2000 to 3500 tons accounts for 23%, and that of ships with a capacity of 3500 to 5500 tons accounts for 10%, as shown in the Figure

1. In terms of the total loading capacity, the total capacity of ships with a capacity of < 5500 tons accounts for about 66%. Among them, the total capacities of ships with a capacity of 1000 to 2000, 2000 to 3500, and 3500 to 5500 tons account for 28%, 22%, and 16%, respectively, as shown in the Figure 2.

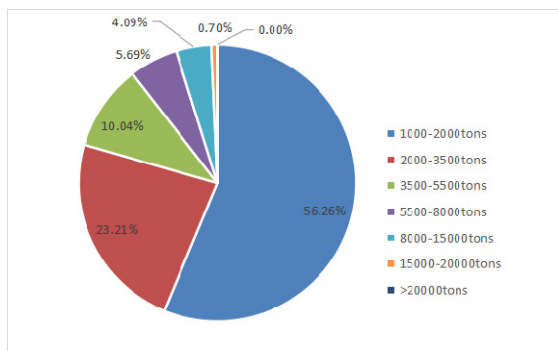


Figure 1: Proportions of numbers of inland ships with a capacity of ≥ 1000 tons.

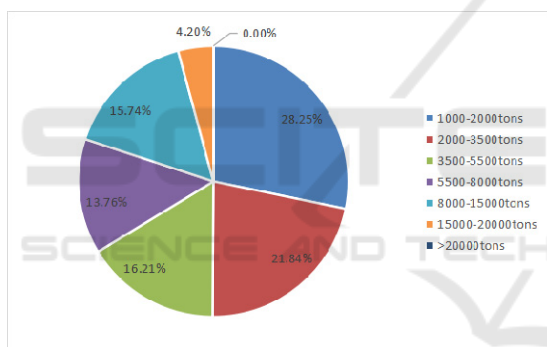


Figure 2: Proportions of total capacities of inland ships with specific capacities of ≥ 1000 tons.

In terms of the ship age, among the inland vessels with a capacity of ≥ 1000 tons, 16.6 thousand ships, with a total capacity of 4127 million tons, were built before September 1, 2011, as shown in the Figure 3. The number and capacity account for 53.04% and 47.76% of the total values. 715 old ships with an age of ≥ 18 years, with a total capacity of 1.31 million tons, account for 2% and 1.5% of the total values, respectively. 78 special-overhaul ships have an age of over 29 years, with a total capacity of 150 thousand tons. Most of the inland ships were built in 2009-2015, accounting for 70% in number. This is closely related to the strong demand for inland river transportation and implementation of the standardization policy of inland ship type. During the implementation of the policy of inland ship-type standardization, from October 1, 2009 to December

31, 2017, 21.5 thousand small and old ships, with a total capacity of 5874.4 thousand tons, were disassembled. 22.5 thousand ships, with a total capacity of 36941.2 thousand tons, were constructed during 2009-2015. The total capacity of ships constructed is 6.29 times that of the ships disassembled. Therefore, the ship-type standardization policy had certain promoting and driving effects, but more new ships were constructed due to the demand of capacity expansion and updating driven by the market.

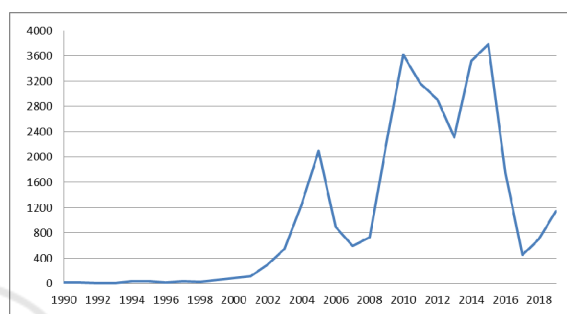


Figure 3: Distribution of the ages of inland ships.

3 PROBLEMS IN THE DEVELOPMENT OF INLAND SHIPS

3.1 Poor Overall Quality of Inland Ships Constructed

The report of the 19th National Congress of the Communist Party of China declares that the structural reform on the supply side should be deepened, and the improvement of quality of the supply system should be the main task in the building of modern economic system (Jia, 2015). Since 2003, a series of inland ship-type standardization policies have been implemented. By encouraging the dying out of small ships, which are adverse to the efficiency of ship lock and violate market demand, as well as the old, unsafe, energy-consuming, and environmentally hazardous ships, the economic, technological and green development levels of the inland ships in China have been comprehensively improved. In the end of 2019, the average net load of inland ships in China was 1095 tons, 10.6 times that in 2000. The adjustment of transport capacity structure has achieved remarkable results, the efficiency of inland river transport has been effectively improved, and the quality of inland

ships on the supply side has been greatly improved, which has greatly promoted the development of the shipbuilding industry. After the development of inland ships in the past 20 years, a strong inland transport fleet adapting to the rapid economic and social growth has already formed. However, the overall quality of inland ships is still far poorer than that of European inland ships and coastal ships of China, and the poor quality is the bottle neck of shipping on the supply side.

Due to the long service life of European inland ships, the requirements for materials, equipment, and technologies during the construction are relatively high, and more attention is paid to maintenance in operation. 40-year-old ships still have good ship conditions, capacities, and appearance, forming an inland river landscape. In contrast, during the construction of inland ships in China, the cost is more important, and the requirements for materials and technologies are less important. In addition, maintenance is lacked during the operation. Although the ships are young, their conditions, capacities, and appearance are not as good as those of the old ships in Europe, and are not in harmony with the development levels of cities along the rivers (CCNR, 2013).

The service life of coastal fleet of China is also shorter than that of Europe, but the overall conditions, capacities, and appearance of coastal ships are qualified, showing no obvious difference compared to Europe. The differences between the coastal and inland fleets of China are closely related to the attributes of their individual markets and development of shipbuilding industry of China (UNECE, 2011).

The construction specifications of coastal and oceangoing ships are consistent, and the marketing operation of coastal ships is closely correlated with international ocean transportation. The circulation between coastal and oceangoing ships is extensive, and the construction of coastal ships is in line with the world, so the overall construction quality level of ships is synchronized with that in the world. On the other hand, the shipbuilding industry of China is one of the three largest shipbuilding bases in the world. In 2019, the capacity output of global shipbuilding in the world reached 98.82 million tons, while that of China reached 36.72 million tons, accounting for 37.2%. The shipbuilding business is mainly export-oriented, and is one of the most internationalized industries in China. The market is highly concentrated in China Shipbuilding Group Co., Ltd, with the market share of as high as 90%. From techniques and operation rules to various regulations

and on-site managements, all the construction procedures are implemented in accordance with the requirements of international norms.

In contrast, the construction of inland ships is different. First, the inland ship construction specifications and standards of China are formed after learning from the relevant experience of the former Soviet Union and European inland ships. However, different from the oceangoing ships circulating in a worldwide market, the inland ship market is relatively independent, lack of room for continuous improvement through global competition.

Secondly, the distribution of inland ship yards is scattered and disorderly, and most of them are private enterprises. The shipbuilding and office places are mostly rented river beach land and wasteland. The facilities are simple and crude, the production mode is extensive, and the techniques, operation specifications, and on-site managements are distinct. Additionally, the inland shipping enterprises, which are mainly individual or small- and medium-sized enterprises, are very sensitive to the shipbuilding cost, leading to the big gap between overall quality of inland ships and that of oceangoing ships.

Thirdly, the inland ships are inexpensive and low-valued compared to coastal ships, lack of long-term attention. Under most circumstances, an inland ship is exclusively designed and built by a private small- and medium-sized shipyard. The ship design and ship-type R & D abilities are far weaker than those of the coastal ones, and both the ship design & manufacturing and shipping enterprises lack innovations and abilities.

Inland shipping enterprises are usually confused when they build new ships. Generally, no shipyard actively designs, develops, and promotes new ship types, and only the existing ship types are selected for construction and modification according to the owner's experience, leading to slow promotion of new ship types and new techniques. Innovations that are the result of extensive dedicated research projects are rarer and even hydrodynamic analysis or hullform optimization through Computational Fluid Dynamics (CFD) or model tests are often not executed during the design stage of inland vessels. In contrast, for seagoing ships, this is common practice. The reasons behind this are not only the gaps in the owner's expertise and lack of financial leeway, but also include the low building cost and fuel consumption of inland vessels compared to seagoing ships. This implies that the potential gain from innovations is often not large enough to justify

large investments in research. Notable exceptions include the crashworthy Y-shaped side structure (Ludolph, 2001), air lubrication of the hull to reduce resistance (Foeth, 2008) and bio-inspired propulsion (Berg, 1996; O-foil, 2015). These innovations are all preceded by extensive research.

3.2 Great Environmental Protection Pressure of The Existing Inland Ships

The inland river transportation will have an environmental impact on both banks, and this is different from the main impact of marine transportation, which is only caused by the entry and exit of ships in the port and terminal operation. However, the release of relevant environmental protection standards of inland ships in China missed the development stage of fleet scale fast expansion and elimination and renewal of a large number of old ships, directly affecting the overall environmental protection level of inland ships. Taking the emission of NO_x as an example, the inland-ship regulations phase I and phase II were implemented in 2011 and 2015, respectively. About 50% of the existing inland ships were built before the implementation of regulation phase I, and the engine maintenance was insufficient in the actual operation of inland ships, resulting in the environmental protection pressures of ships such as air pollution.

3.3 Difficult Renewal of the Inland Shipping Enterprises

The recent survey of development of inland shipping reports that most of the shipping enterprises tend to upgrade the inland ships. The reasons are the following. First, with the innovative technologies such as new engine energy-saving technologies, the economy of new ships will be greatly improved; Secondly, the maintenance cost of most of the inland ships will increase if their ages are longer than 10 years, and the economy is far lower than that of new ships; Thirdly, the supply and demand of transportation capacity in the inland shipping market of China are more and more stable, and the focus of business is changing from rapid expansion of transportation capacity to occupy the market to the improvement of operation efficiency of current market.

The inland shipping enterprises surveyed reflect that the disassembling of 10-year-old ships costs a lot, and the ideal dealing mode is to sell it as a

second-hand ship. Some second-hand ships can be sold to Southeast Asia. However, the inland river freight volume of China is the largest in the world. Especially, since 2000, the transportation capacity of inland ships was expanded rapidly. The demand for inland ships in Southeast Asia and other regions is negligible.

4 SUGGESTIONS FOR PROMOTING THE DEVELOPMENT OF HIGH-QUALITY INLAND SHIPS

Currently, the shipbuilding industry is in the new situation of market downturn and increasing pressure of transformation, and the problem of overcapacity is obvious. Most of the inland shipyards are built near rivers. The environmental protection pressure and safety risk along the Yangtze River are relatively high, the adjustment, transformation, and upgrading of industrial structure are urgent. It is also urgent to integrate and optimize the existing assets, by centralizing technologies, intelligence, facilities, and other resources, and to promote the integration and regrouping of inland shipbuilding enterprises for the purpose of scale benefit. The overall strategy to promote the high-quality development of inland ships is to combine the upgrading of inland ships with the structural adjustment and transformation-upgrading of the shipbuilding industry, to encourage the disassembling and building activities of shipping enterprises with financial subsidies, to reduce the financing and insurance costs of shipping enterprises by introducing financing and insurance institutions, to reduce the increase of shipbuilding costs caused by the improvement of quality, and to encourage the daily maintenance activities of inland ships.

1. Promoting the high-quality development of inland ship building industry on the supply side. Promote the merging, regrouping, and cooperation of large state-owned shipbuilding groups with advanced technologies and strong shipbuilding abilities with inland ship building enterprises with strong comprehensive abilities, and improve the design, construction technology, and equipment of shipyards to improve the construction quality of inland ships. The mode of "government-funded support" should be adopted to guide the cooperation between shipbuilding enterprises. The large-scale ship enterprises provide technical assistance, and

small- and medium-sized shipbuilding and supporting enterprises participate in the R & D, production and manufacturing, R & D and production of supporting modules and various parts, to improve the overall technical level of inland ship building industrial chain. Promote the transformation of some shipbuilding enterprises into ship maintenance and repair enterprises, develop the entire-life-cycle service industry for inland ship repair and maintenance, and improve the daily maintenance level of inland ships.

2. Releasing and promoting preferable ship types. The ship type optimized should be selected as the parent ship for further modification and redesign of the cabin layout and appearance. By optimizing the materials and equipment operation and improving the construction technologies, characteristic inland ships which adapt to the level of economic and social development in China can be built, and the ship types should be released to the society to encourage the development and application of these types in primary inland river shipyards. In addition, the technical schemes of inland ships with advanced technologies such as new energy, clean energy, and intelligence should be released as demonstrations to lead the green and intelligent development of inland ships.

3. Implementation of economic encouragement policies to adjust the technical-level structure of inland ships. Compensate the shipping enterprises with a certain amount of subsidy for their disassembling of inland ships with ages of ≥ 10 years, and provided subsidy for those enterprises building ships with types encouraged after the disassembling. On the other hand, introduce large-scale financing and insurance institutions to provide financing convenience for the shipping enterprises that perform entire-life-cycle management and maintenance of new inland ships, to reduce the financing and insurance costs.

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