Comprehensive Evaluation Index System of Green Intelligent Technology for Yangtze River Ships

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ABSTRACT

Based on the characteristics of the Yangtze River shipping, this paper analyzes the development of green intelligent technology for inland ships, comprehensively considers the safety, technology, environment, and economy of ships, clarifies the principle of index system construction, and uses Delphi method and dynamic cycle screening model to determine evaluation index. With the attributes of Time, Ship Type, Technology, and Effect, the important adaptive index in different scenarios are screened out to build a dynamic index system.

KEY WORDS: Yangtze River; ships; green; intelligent; comprehensive evaluation; index system; dynamic screening

INTRODUCTION

China has developed inland waterway transportation, which has the advantages of large capacity, low cost, small footprint, low energy consumption, and low pollution. Inland waterways such as the Yangtze River play an important role in optimizing the transportation structure and reducing the cost of comprehensive social logistics. Speed up the promotion of clean energy for ships, improve the comprehensive prevention and control system of ship pollution, and promote the development of green ships. The application of technology to inland watercraft has become an important measure to promote the high-quality development of inland waterway shipping in China.

However, in the face of the ever-changing green intelligent technology, there is currently no perfect evaluation index system for inland river green intelligent ships in the world. Among them, the differences in the applicability and maturity of green intelligent technology, the index system involves many elements, and the number of indexes is large. The characteristics such as multiple categories, multiple attributes, and the existence of correlations between certain index are the reasons why this evaluation system is difficult to establish. Therefore, this paper focuses on the comprehensive assessment of the application of green and intelligent technologies for ships, and aims at the large number of ships and types of ships in China's inland rivers. Diversity, complex navigation environment, high economic dependence on technology application, and its safety, technological advancement, economic rationality, and environmental coordination are extremely complicated. Select the Yangtze River, a typical Chinese inland navigation environment, and carry out evaluation index system research.

Shipping Background and Technology Status

1) Status of Yangtze River shipping

Yangtze River Shipping holds an absolute leading position in China's inland river shipping. With the largest volume and navigable traffic, it is the first in the world's inland rivers to pass the cargo for many years. Promoting the high-quality development of the inland river basins such as the Yangtze River and the green and intelligent development is the current policy direction of China. The Outline of the Development Plan for Belt Development proposes that "by 2020, the Yangtze River Golden Waterway will be basically built into a comprehensive three-dimensional transportation corridor that connects high efficiency, safety and convenience, and green and low carbon."

According to the statistics of the Ministry of Transport, as of the end of 2018, there were 124.3 thousand domestic river transport vessels, of which 105.6 were inland river transport vessels in the Yangtze River system. 10000 ships, accounting for 84.95%; net deadweight tonnage is 115.664 million tons, accounting for 89.55%; freight volume is 3.0598 million tons, accounting for 81.75%. From the perspective of the capacity structure of transport vessels, conventional dry bulk carriers accounted for 90% of the total capacity, indicating that dry bulk carriers still play a leading role. From the perspective of ship types, the number of barges and motorized ordinary cargo ships accounted for 31.7%, 37.7%, accounting for 33.96% and 43.9% of the total tonnage of the ship, respectively. From the perspective of capacity distribution, the upstream area accounts for a small proportion, and the middle and lower reaches account for a large proportion. From the perspective of vessel age, the average vessel age is about 10 years, of which the number of motorized ordinary cargo ships, ordinary passenger ships, push (tug) ships, barges and old foreign-related tourist ships accounted for 9%, 46%, 50%, 40% and 51% respectively (Yao,2018).

2) Green development of ships

In order to curb the trend toward global warming, many technical, operational, and policy options have been proposed to help reduce the emissions from international shipping—the carrier for 80% of the