Research on the Development Trend of Green Waterway Transportation in the New Era

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Abstract: As an important part of comprehensive transportation system, waterway transportation has unique advantages in energy saving and emission reduction. In recent years, China has carried out a series of work to promote the green development of waterway transportation in terms of system construction, standard guidance and technology popularization and application, and achieved remarkable results. However, compared with the development needs in the new era, there are still some problems in green water transportation, such as unbalanced development, weak basic management, imperfect standard system, imperfect system and mechanism, and insufficient scientific and technological innovation. On the basis of combing the current situation and problems, this paper puts forward suggestions on the development of green water transportation in the new period from the aspects of industry governance, pollution prevention and control, ecological restoration, safety wisdom, etc., for the reference of the industry.

1. The Achievements of Green Waterway Transportation Development

Transportation is the forerunner of socioeconomic development, as well as the key field in energy-saving and emission-reduction responding to climate change for the country. Green transportation is an essential feature and inherent requirement of “Powerful Transportation Country”. The construction of green transportation directly affects the developmental process of the modern transportation system. As an important part of the integrated transportation system, waterway transportation has unique advantages in energy-saving and emission-reduction[1]. According to relevant research estimation, the energy consumption intensity of Chinese seaborne ships is about 0.24 kg standard coal/100 ton-km, which is much lower than that of the trucks for 1.8 kg standard coal/100 ton-km[2]. Thus, the comparative advantage of low-carbon waterway transportation is very evident. However, the energy saving and environmental protection advantages

of Chinese waterway transportation have not been fully achieved for the moment, with the regardless of green development concept, low level of intensive and comprehensive recycling resource utilization, as well as the long way to go for the pollution prevention, which provides an opportunity for us to study on green waterway transportation in the near future[3].

Promoting the development of green waterway transportation is a powerful measure to implement Xi Jinping's ecological civilization thought, as well as an inevitable requirement for realizing the sustainable development of the industry[4]. Our country has carried out a series of work to promote the development of green waterway transportation in institutional system construction, standard and normative guidance, technology promotion and application for years, achieved with remarkable results, providing vigorous support for the construction of green transportation.

1.1.The Continuous Improvement of Green Development Institutional System

Since the "13th Five-Year Plan", the legal documents have put forward clear requirements for the development of green transportation, including the "Air Pollution Prevention and Control Law of People's Republic of China", the "Law of the People's Republic of China on Prevention and Control of Water Pollution", the "Laws of Saving on Energy Resources in R. P. of China", the "Three-Year Action Plan to Fight Air Pollution", etc. In response to the call of the Party Central Committee and the State Council, the Ministry of Transportation successively issued a series of key documents, including the "'13th Five-Year' Development Plan for Energy Conservation and Environmental Protection of Transportation", the "Promoting of Implementing Scheme of Ecological Civilization Construction of Transportation", the "Opinion on Promoting the Development of green transportation of Ministry of Transportation", etc. Focusing on the development of key green waterway transportation fields, such as ship emission control areas, shore power, gas recovery, reception, transfer and disposal of ship pollutants and waste, dust prevention and control, etc. The continuous improvement of the green development institutional system has provided top-level design and overall guidance for the development of green waterway transportation.

1.2. The Increasingly Complete of the Standard and Normative System

The development of green waterway transportation is inseparable from the support and guidance of standardization and normalization. In recent years, the "Green transportation Standard System (2016)", the "Waterway Engineering Standard System" and other documents have been issued successively, and the standards and normative system has been increasingly completed.

1.3. The Promotion and Application of Green Technologies is Further Enhanced

The thematic experimental construction of Eco-ports in initial stages has enabled many mature energy-saving and emission-reduction technologies to be promoted and applied. Although shore power, gas recovery, LNG, dust prevention and other technologies have significant energy-saving and emission-reduction benefits, the promotion is slow in the industry due to the problems such as large investment and low economic benefits. In order to promote the application of shore power technology well, from 2016 to 2018, the State Council approved the capital reward-rule to support the acceleration of shore power facilities construction and ship power receiving facilities and equipment transformation projects. In the same time, the "Port Layout Plan", the "Technical Specification for Facilities Construction of Shore Power in Terminals" and other standards were issued, promoting the national wide facilities construction of shore power. In addition, related

policy documents and standards for gas recovery and LNG technology were also issued.

2. The Problems of Green Waterway Transportation Development

2.1. The Unbalanced Development is Relative Prominence

The problems of unbalanced development include regional development and industrial distribution. At present, the implementation subject of green waterway transportation construction in China is mainly the enterprise groups in the more developed coastal economy areas, while the less developed inland river economy areas have relatively poor infrastructure and the scale effect is not significant, resulting the small and medium-sized enterprises in these areas are not very enthusiastic about the construction of green waterway transportation, with the narrow range of green waterway transportation promotion[5]. On the other hand, under the guidance of policies, the construction of Eco-ports has been promoted more vigorously. In contrast, there are not many policies and measures to guide waterway transportation enterprises and waterway construction and maintenance companies in green development.

2.2. The Basic Management is Comparatively Weak

Mainly manifested in the weak statistical monitoring ability and lack of basic data. The statistics and monitoring are the basis for formulating various energy-saving and emission-reduction policies. The Ministry of Transportation has issued statistical reporting systems such as the “Statistical Report on Energy Consumption of Transportation” and the “Statistical Survey System for a Set of Questionnaires of Highway and Waterway Transportation Enterprise”, but there are small number of key monitoring companies and limited statistical scope, in addition with manual data filling, making it might be mistakes included and not good enough in data mining for the industry for energy saving, emission reduction and coping with climate change.

2.3. The Standard System Needs to be Improved

Due to the lack of top-level design of the green waterway transportation standard system, the existing standard system of green waterway transportation is not sound, covering incomplete content, and cannot meet the standardization needs of green waterway transportation. In addition, there are no corresponding system and requirements to carry out this work after some standards are promulgated, resulting in a low usage rate of the standards. For example, the “Detection Method for Energy Efficiency of Electrodynamic Crane in Ports” and the “Detection Method for Energy Efficiency of Belt Conveyor in Ports” have been promulgated for many years, the usage rate of the standard is low for the industry has not organized to carry out energy efficiency testing. Similarly, if the pilot demonstration of energy efficiency management and the third-party assessment of the energy efficiency grade of port equipment are not launched, the “Technical Regulation for Energy Efficiency Management in Port Terminals” and the standards on the energy efficiency grade of port and equipment also cannot play a role in guiding the green development of the industry.

2.4. The System and Mechanism Need to be Improved

The construction management work of green waterway transportation involves the transportation department, the development and reform department, the environmental protection department, and the marine department, etc. The management mechanism remains to be further coordinated. It is necessary to strengthen the communication, coordination and division of labor among various

departments to form a joint force. Besides, for present, the institutional system related to green waterway transportation has not been established, with a shortage of energy saving and environmental protection control system including the whole process of planning, design, construction and operation, leading to ineffectively guide for local government and enterprises to carry out. The release of "Review Method of Energy Saving of Fixed Assets Investment Project" in 2016, raised the doorsill of energy consumption for conducting energy saving review, but energy saving assessments for waterway transportation construction projects have been greatly reduced. The industry cannot control the energy consumption of construction projects from the original source, and some mandatory energy consumption quota standards have not been implemented. In addition, the energy conservation and environmental protection work in the construction stage has not yet been launched[6]. Although it has been studied in the channel construction phase, it is not presently implemented. During the operation stage, pilot demonstrations of thematic construction of Eco-ports and the promotion of shore power, gas recovery, LNG and other technologies were mainly carried out, encouraged and guided by means of capital subsidies for most of them. With the continuous advancement of the green waterway transportation construction, the establishment of systems should be considered to promote the improvement of the level of green development in the operation stage.

2.5. Science and Technology Innovation Intensity Should be Strengthened

Judging from the effectiveness of the promotion and application of waterway transportation energy-saving and emission-reduction technologies in recent years, the benefits of energy-saving and emission reduction are significant, and economically reasonable technologies are easier to promote in the industry, such as container stack gantry crane "oil-to-electricity", large-scale mechanical frequency conversion and electric power feedback technologies, etc.[7]. However, in recent years, the new technologies for energy-saving and emission-reduction in waterway transportation are relatively lacking with significant benefits, reasonable economy and suitable for promotion and application, which has become one of the key factors affecting the development of green waterway transportation. In addition, the current demonstration and promotion of shore power, gas recovery and other technologies are also facing some problems, such as the mismatch between construction and usage made by the unconsummated system, leading to the not prominent of the benefits of energy-saving and emission-reduction.

3. Developmental Direction of Green Waterway Transportation

The "Construction Outline of Powerful Transportation Country" has proposed clearly to build modern comprehensive transportation system which are safe, convenient, efficient, ecological and economical, taking green development, saving, intensive use and low-carbon environmental protection as important orientation for future transportation development, making it become the general starting point for promoting the development of green waterway transportation in the new era.

Therefore, to promote the development of green waterway transportation and solve the problems based on mechanism innovation as well as scientific and technological progression. According to the current status and needs of green development in the industry, the four aspects: "+industry governance", "+pollution prevention and control", "+ecological restoration" and "+safety and wisdom" could be starting with.

For industry governance, by taking the research on waterway transportation industry green development system design, development planning, big data management, standard system, effectiveness supervision and assessment, Eco-ports evaluation index system, red line for

construction projects crossing (over) the ecological protection area reasonably, evaluation measures of energy-conservation and emission-reduction, ecological compensation mechanism as the main breakthroughs; the "infrastructure + transportation service + ecology" as the feature; relying on the important support of the "think tank advice", strategic planning, standard development, platform construction, comprehensively increase the green transportation governance capabilities and the modern governance systems research level, powerfully support industry structure optimization and management innovation.

For pollution prevention and control, aiming at problems such as no clear data on dust pollution of bulk cargo ports and outmoded measures, study on the technologies of windproof net construction and evaluation, intelligent detection for dust concentration of bulk cargo port, to conform the intelligent and precise control system for dust pollution of bulk cargo ports with a set of technologies. Focusing on the current problems of insufficient supervision level of ship tail gas and outmoded measures, make breakthroughs in ship tail gas telemetry technology to develop equipment and system of ship tail gas telemetry. Pay special efforts to gain breakthroughs in landing treatment technology of ship's ballast water, characteristic wastewater, while develop intelligent monitoring equipment and systems for ship wastewater. Research and develop advanced sewage treatment, intelligent control and reuse technologies and equipment in the port area.

For ecological restoration, the current problems in China are that it is difficult to assess the effect of port and coastal ecological restoration and the restoration model is outdated. It is possible to research on coastal ecological restoration models of different degrees of degradation of coastal ports, hoping to form a complete set of technologies about functional recovery for the damaged ecosystem structure of typical port and coastal. On the other hand, the pollution prevention and control technology of port solid waste in the whole life cycle and its use of integrated technology, the resource utilization of dredging soil of harbor basin and navigation channel, the soil pollution survey and the ecological rehabilitation technology, etc. could also be considered. Aiming at the problems such as unclear connotation of ecological channel, inconsistent construction standards and imperfect monitoring system, focus on the research and development of the whole chain technology of "Construction, management, maintenance, use" of ecological channel hydraulic structures, the biological monitoring for the whole process of channel improvement projects, and post-evaluation technology.

For safety and wisdom, the current problems of insufficient coordination in shore power between ship and shore and low utilization rate of shore power, could be solved by improving the on-line monitoring and operation optimization of shore power system, the shore power management system and the big data analysis technology, building the cloud monitoring system for port ship shore power operation, developing the research on traceability technology of shore power accident, the port shore power maintenance technical system. In addition, construct energy consumption online monitoring and big data analysis system based on 5G, cloud technology, blockchain, epc system network, develop the port intelligent energy system and formulate the corresponding specifications, simulation system of intelligent energy consuming. Realize the quantitative assessment and visualization of energy consumption in the handling technological process to form the integrated platform for energy consumption control, management and operation.

4. Conclusion

Only by working along many lines in the same time and comprehensive treatment, the energy conservation and environmental protection advantages of the waterway transportation industry could be fully achieved, while the concept of green development can truly "fall and take root" in the transportation industry, and gradually realize the goal of "the blue hills and green streams" and

permanent development in waterway transportation industry.

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