



Analysis on the Prevention and Control Measures of Water Pollutants from Ships in the Yangtze River Economic Zone Based on E-vessel Bigdata System

Hongyan Wang¹, Lei Chen², and Yujun Tian¹(✉)

¹ China Waterborne Transport Research Institute, Beijing, China
wanghy@wti.ac.cn

² Ministry of Transport, Beijing, China

Abstract. Since the 18th National Congress of the Communist Party of China, General Secretary Xi Jinping has put forward a series of new ideas and requirements on the construction of ecological civilization, and required that priority must be given to ecology and green development. Because the Yangtze River Economic Belt has extremely high economic, ecological and social value, the government emphasizes the restoration of the Yangtze River's ecological environment in an overriding position. However, due to the increase of traffic in the Yangtze River Economic Zone, pollutants generated by ships have brought greater pressure and challenges to the ecological safety and environmental protection of the Yangtze River waters. Therefore, this paper mainly sorts out the laws and regulations related to the prevention and control of water pollution in China, and analyzes the achievements and shortcomings of the special rectification action for the prevention and control of ship and port pollution in the Yangtze River Economic Zone. It also analysis the reason of shortcomings by using the E-vessel bigdata system, which shows that incomplete connection of pollutant receiving, transshipment and disposal facilities and low enthusiasm for washing the tank are the main problems needs to be solved. Finally, this paper puts forward the prevention and control measures for ship and port water pollutants in the Yangtze River Economic Belt, with emphasis on ship oily wastewater and chemical tank washing water.

Keywords: prevention and control of ship and port pollution · water pollutants generated by ships · joint supervision and service information system · special remediation · chemical tank washing water · oily wastewater · E-vessel bigdata system

1 Introduction

The Yangtze River Economic Belt flows through 11 provinces and cities, covering an area of approximately 2.05 million square kilometers, accounting for 21% of China, and its total population and economic output exceeding 40% of China, which has extremely

high economic and social value. While continuing to meet the economic and social development of the areas along the Yangtze River, the Yangtze River trunk line transportation also brings serious pressure and challenges to the ecological safety and environmental protection of the Yangtze River waters. According to statistics, the number of inland water transport ships in the Yangtze River Economic Zone has reached 120,000, and there are more than 250 types of dangerous chemicals through production and transportation. Hundreds of thousands of crew members have produced a large amount of domestic garbage and sewage from ships, as well as a large amount of oily sewage and chemical tank washing water during the operation of oil tankers and hazardous chemicals ships. Therefore, the reception, transshipment and disposal of ship pollutants are very important for the prevention and control of inland river water pollution.

2 Domestic Legislation

In response to the pollution control of inland water vessels, the State Council, ministries and commissions, and research institutes have been committed to formulating corresponding policy measures and technical standards.

2.1 Legislation Related to the Prevention and Control of Ship Water Pollution

Regarding the prevention and control of water pollution from ships, the “Law of the People’s Republic of China on the Prevention and Control of Water Pollution” [1] stipulates overall measures for the prevention and control of water pollution by ships, prohibits the discharge of pollutants such as waste oil and garbage from ships. The responsibilities of ports, docks, loading and unloading stations, ship repair plants and third-party receiving units are stipulated, and the regulatory requirements of relevant competent authorities are clarified in the law. “Action Plan for Prevention and Control of Water Pollution” [2] has increased water pollution prevention and control efforts, and clearly stipulated the time nodes and related measures for the prevention and control of pollution from ships in coastal and inland rivers as well as the enhancement of pollution prevention and control capabilities of ports and wharves.

2.2 Relevant Requirements for the Prevention and Control of Inland River Water Pollution

To prevent and control the pollution of inland waters by ships and their operations, and protect the environment of inland waters, the Ministry of Transport has formulated the “Regulations on the Prevention and Control of Environmental Pollution by Vessels in Inland River Waters” [3], which stipulates that necessary pollution prevention and control measures should be taken for the following matters: the recording methods of oil tanker and oil barge operations, the types and recording methods of documents that should be available on board, the collection and discharge of ship garbage, the discharge and receipt of ship pollutants such as the receipt documents of ship pollutants, and the operation activities of the ship. More than 60% of inland river ships in China are small ships with less than 400 gross tonnages, which are distributed in the Yangtze River, Pearl

River and other water systems and inland waters along the Beijing-Hangzhou Canal. The Ministry of Transport has formulated the “Measures for Prevention and Control of Water Pollution by Inland River Vessels with Gross Tonnage less than 400 tons” [4], which regulates the storage, treatment, discharge and delivery of water pollutants from inland waterway vessels with gross tonnage less than 400 tons.

2.3 Prevention and Control of Water Pollution from Ships in the Yangtze River Economic Zone

It is essential to fully carry out the new era development concept of the 19th National Congress of the Communist Party of China on ecological civilization and the construction of a beautiful China, earnestly implement the spirit of General Secretary Xi Jinping’s instructions on the Yangtze River Economic Belt of “Step up conservation of the Yangtze River, stop over development”, so that the implementation of laws and state policy documents such as the “Law on the Prevention and Control of Water Pollution” and the “Action Plan for the Prevention and Control of Water Pollution” regarding the prevention and control of environmental pollution from ships can be promoted. In view of the prominent problems in the Yangtze River Economic Belt, such as the high risk of ship pollution, the incomplete connection between the receipt and disposal of ship pollutants, the lack of ship compartment cleaning facilities, and the insufficient emergency response capacity for ship pollution emergencies, the Ministry of Transport has decided to organize a special campaign to prevent and control ship pollution along the Yangtze River Economic Belt from 2018 to 2020 based on the “Guidelines of the Ministry of Transport on promoting the development of green Shipping along the Yangtze River Economic Belt”[5] (Water Transport Bureau, Ministry of Transport [2017] No. 114). To comprehensively and systematically improve the pollution prevention and control capabilities of ships and ports in the Yangtze River Economic Zone, and accelerate the green development of shipping, the Ministry of Transport, the Development and Reform Commission, the Ministry of Ecology and Environment, and the Ministry of Housing and Urban-Rural Development jointly formulated the “Remediation Plan for Acute Pollution from Ships and Ports in the Yangtze River Economic Belt”[6], carried out in-depth one-year special rectification work, and formed the “Opinions of Ministry of Transport, Development and Reform Commission, Ministry of Ecology and Environment, Ministry of Housing and Urban-Rural Development on establishing and improving a long-term mechanism for the prevention and control of ship and port pollution along the Yangtze River Economic Belt”[7]. In addition, the Ministry of Transport actively cooperates with the legislative work of the National People’s Congress and incorporates the relevant practices and systems of ship and port pollution remediation into the contents of the Yangtze River Protection Law [8].

2.4 Technical Requirements for Pollution Prevention and Control

To ensure that ships discharge pollutants in compliance with regulations, relevant ministries and commissions have issued relevant standards, regulations, and management measures. The “Standards for Discharge Control of Water Pollutants from Ships”[9] stipulates the discharge control requirements for oily sewage, domestic sewage, sewage

containing toxic liquid substances, and ship garbage; the “Guidelines for the Design of Onshore Reception Facilities for Ship Water Pollutants Inland River Ports” [10] has designed the standard of receiving facilities for ship’s domestic garbage, domestic sewage and oil-bearing sewage; “Technical Rules for the Statutory Inspection of Inland Water Vessels” [11] stipulates inspection techniques for structures and equipment to prevent ships from causing pollution.

For ship washing and receiving water, the “Regulations on the Safety Supervision and Administration of Ships Carrying Dangerous Goods” [12] stipulate that after the discharge of cargo is completed, inland river vessels carrying liquid dangerous goods in bulk shall clean the cargo space at the wharf, special anchorage and tank washing stations with the conditions for tank washing. While the tank washing water shall be delivered to be received and handled by the port receiving facilities, the ship’s pollutant receiving units or professional receiving units. The “Interim Rules for Statutory Inspection Techniques for Inland Water Hazardous Chemicals Washing Barges” [13] provides technical standards for the design, construction and standardized operation of hazardous chemical washing barges on the Yangtze River, which can effectively prevent tank washing water from being discharged directly into rivers and polluted waters, and contribute to the green development of the Yangtze River Economic Belt.

3 Special Rectification of Pollution from Ships and Ports in the Yangtze River Economic Zone

3.1 Reasons for Special Rectification

The problems of illegal chemical tank washing in the Yangtze River Economic Belt continue to increase despite repeated prohibition. In 2018, among the major environmental pollution case that discharged the tank washing water of hazardous chemicals ships into the Yangtze River, the tanks of hazardous chemicals ships are illegally washed for more than 70 times, and the tanker washing water is disposed for more than 40 times. More than 500 tons of severely exceeded washwater was discharged to the Yangtze River through the concealed pipe behind the boiler house, and oil sludge and oil residues were randomly stacked on the river beach [14].

In terms of the issue of illegal discharge of tank washing water from ships in the Yangtze River Economic Zone, “China Water Transport News” [15] reported that “At present, about 80% of the toxic and harmful Yangtze River hazardous chemicals transport ships washing water disappeared, becoming one of the sources of pollution in the Yangtze River.” “Navigation” [16] reported that “in 2015, the reported tank washing operations for a certain section of the Yangtze River trunk line were less than 3% of the number of approved ships entering and leaving the port; the chemical tank washing water registered and accepted by the maritime department was less than 4% of the theoretical calculation value.”

As for the destination of the ship garbage in the Yangtze River Economic Belt, Xinhua News Agency reported in October 2019 that there are nearly 120,000 inland freight ships in the Yangtze River, and hundreds of thousands of crew members work and live on the river all year round. A large amount of domestic garbage and sewage,

oily sewage, chemical washing water, and residual oil are generated on the ships. The destination of waste oil is unknown, and there are 185 ship pollutant receiving companies and only more than 200 pollutant receiving ships on the Yangtze River trunk line. It is unknown that whether it can meet the pollutant receiving demand of such a large volume of ships [17].

The 2020 ecological environment warning film inflects that some provinces and cities have not established ports and ship receiving and transshipment mechanisms, and some ports and dock pollution control facilities have been idle for a long time. Although some ports have built domestic sewage and oily sewage collection facilities, they have not been used since their completion. The oily sewage collection and oil-water separation facilities of some terminals have not been used, and the oily sewage and domestic sewage in the sewage tank of the terminal are illegally mixed and stored.

3.2 Focus and Results of Special Rectification Work

All provinces and cities have actively responded to General Secretary Xi's request to carry out precise, scientific, and legal pollution control on the pollution problems of ships and ports in the Yangtze River Economic Belt. After a one-year special rectification work for the prevention and control of pollution from ships and ports, significant results have been achieved.

There are still lots of prominent issues, such as the high risk of ship pollution in the Yangtze River Economic Zone, the incomplete connection between the receiving and disposal of ship pollutants, the lack of ship washing facilities and emergency response capabilities for ship pollution incidents. After a one-year special rectification, the provinces and cities of the Yangtze River Economic Belt have over-fulfilled the task of renovating the domestic sewage collection or treatment device of ships, and renovated 30,000 ships in total; achieved full coverage of port pollutant reception facilities, and cumulatively built mobile and fixed reception facilities 14,000; these cities completed the renovation and upgrading of the terminal's own environmental protection facilities and the improvement of environmental protection procedures, and cumulatively upgraded about 1,000 of the terminal's own environmental protection facilities; the promotion and application of clean energy such as shore power and LNG were strengthened, and 500 shore power berths were added.

The Ministry of Transport has developed a joint monitoring and service information system for ship water pollutants in the Yangtze River Economic Zone (E-vessel bigdata system), which clarifies the scope of responsibility of the Ministry of Transport, the Ministry of Ecology and Environment, and the Ministry of Housing and Urban-Rural Development [18]. On July 1, 2020, the Ministry of Transport developed and launched the joint supervision and service information system (E-vessel bigdata system) of ship pollutant, and strengthened its promotion and application together with the Ministry of Ecology and Environment and the Ministry of Housing and Urban-Rural Development, basically covering all ports in the Yangtze River Economic Zone and more than 60% of ships. It promotes the electronic management of ship pollutant receiving, transshipment and disposal documents, and the number of system users has reached 165,000. The source and destination of pollutants from ships can be traced, and a new pattern of joint supervision and Internet supervision is established.

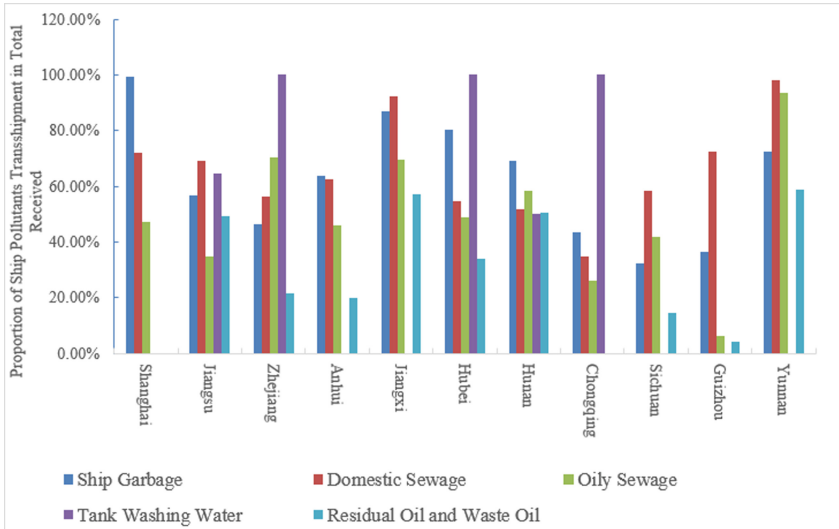


Fig. 1. Percentage of ship pollutants transshipment volume in total received

3.3 Unsolved Problems of the Special Rectification Work

3.3.1 Incomplete Connection of Pollutant Receiving, Transshipment and Disposal Facilities

Through E-vessel bigdata system, from April 1 to July 1, 2021, the proportion of the transshipment, disposal and reception of various types of ship pollutants in various provinces (municipalities) is obtained. Taking Jiangsu as an example, the volume of waste transported and disposal volume by ships accounted for approximately 50% and 20% of the received volume, respectively. The volume of domestic sewage transported and disposed volume by ships accounted for 70% and 44% of the received volume, respectively. Oily sewage transshipment volume and disposal volume accounted for about 30% and 20% of the received volume respectively. The chemical tank washing water transfer volume and disposal volume accounted for about 70% and 50% of the received volume, respectively. The residual oil and waste oil transfer volume and disposal volume accounted for about 50% and 20% of the received volume respectively. The data shows that the amount of pollutant transshipment and disposal by ships is far from the amount of pollutants delivered by ships arriving at the port, which has not reached the effective connection of receiving transshipment and disposal Fig. 1. and Fig. 2.

3.3.2 Low Enthusiasm for Washing the Tank

According to the “Layout Plan for Washing Stations on the Main Line of the Yangtze River”, the washing capacity of the 13 washing stations on the Yangtze River Main Line will meet the washing demand of 7,800 vessels per year in 2020, and the demand for washing in 2025 will be 9,600 vessels per year. But as of the end of 2020, 13 washing stations have accumulated more than 200 washing times, which is far from the

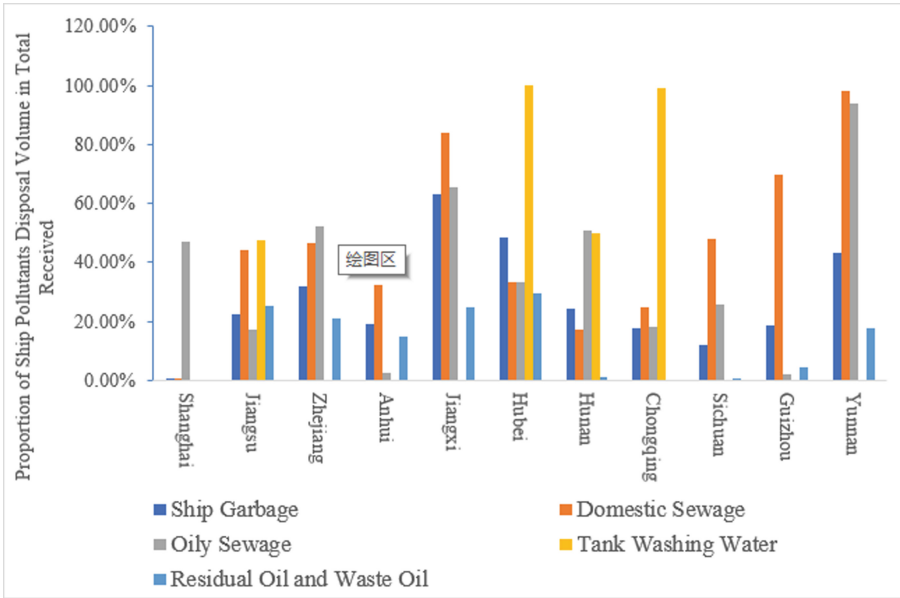


Fig. 2. Percentage of ship pollutants disposal volume in total received

requirements of design. The low enthusiasm for washing tanks is caused by different reasons. First, the cost of tank washing is too high. Enterprises choose to process the tank washing water with a qualified company. Most of the cost of transshipment and disposal is borne by the terminal company. The transshipment unit sends a receiving vehicle for transshipment. In the absence of government subsidies, the burden of wharf enterprises is too large. The second is that the management department has not established a catalog of cargo washing tanks, lacking mandatory and guiding policy documents, and there are situations in which terminal companies do not wash tanks to save costs.

4 Experience and Inspiration

In response to the problems found in the special rectification of pollutants from ships and ports in the Yangtze River Economic Zone, including problems such as incomplete connection between receiving, transshipment and disposal facilities, low enthusiasm for tank washing, and undeveloped catalogue list of replacement cargos, the following measures are proposed.

4.1 Introduction of Standard Specifications

The first is to issue relevant documents to clarify the responsibilities and obligations of shippers and carriers in the reception and transshipment of pollutants, and to implement personal responsibilities. The second is to formulate the standard for the cargo washing catalog, clarify the requirements for ship washing and stripping operations, and unite

the 13 washing stations on the Yangtze River trunk line in order to uniformly regulate the washing price and the supervision of the washing water. The third is to establish a compatibility list of cargo types to dynamically track the transportation trajectory of compatible cargo types and determine whether it is necessary to wash tanks when transporting compatible cargo types, as a reference standard for tank washing.

4.2 Implementation of Corporate Responsibility

Each terminal enterprise shall establish a ship-to-shore handover and joint inspection system and formulate inspection forms. For ships that refuse to deliver without reasonable reasons or are suspected of arranging them, their loading and unloading operations may be suspended, and the relevant information may be reported to the maritime administrative agency. The terminal and its entrusted receiving unit shall have ship water pollutant receiving facilities that meet the receiving needs of arriving ships and ensure normal operation, and shall not refuse to accept water pollutants such as oily sewage, tank washing water, domestic sewage and garbage from vessels calling at ports, and shall accept vessel supervision. For the reception of ship washing water and oily sewage, it should be in accordance with the “Regulations on the Safety Supervision and Management of Ships Carrying Dangerous Goods” and other relevant documents to ensure that the ship can be washed thoroughly. People should make full use of the system records of the “Cargo Record Book” and “E-vessel bigdata system” to check the historical handover of the washing water of the berthing ship, and confirm the type of cargo carried by the ship, the last time of receipt, the receiving unit, the receiving location and other information. In the case of no handover record, too long interval between delivery and reception, and other circumstances of suspected illicit discharge, the wharf enterprise should suspend the loading and unloading operation of the ship and report the relevant situation to the maritime administrative agency.

5 Conclusion

The article systematically puts forward the results and unsolved problems of the special rectification of ship and port pollutants in the Yangtze River Economic Belt, which is generally reflected in: the foundation of pollution prevention and control is not strong, the management of reception, transfer and disposal of ship pollutants has not yet fully formed a closed-loop mechanism, the overall utilization rate of shore power facilities is still not high, and the construction of LNG bunkering facilities is still unfinished. In conclusion, it will take a long time to establish and improve a long-term mechanism for the prevention and control of ship and port pollution in the Yangtze River Economic Belt, and to form a ship and port pollution control system with reasonable layout, smooth connection, efficient operation, and strong supervision.

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