Research on the Current Situation of Dangerous Goods Safety Production in Zhejiang Port Based on Third-Party Safety Inspection

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Abstract. In order to further grasp the current situation of safety production management of dangerous goods in ports of Zhejiang Province and improve the safety production management level of dangerous goods enterprises in ports, this paper studies and analyzes the results of the third-party safety inspection of dangerous goods in ports of Zhejiang Province in 2022. By analyzing a large number of first-hand information, including the number of berths, the level of major hazard sources, the types of loading, unloading, storage and transportation, the number of hidden dangers, and the test results of the ability of production personnel and management personnel, from the perspective of safety production management, this paper studies the causes of potential safety hazards in dangerous goods enterprises in Zhejiang Province, and gives corresponding countermeasures and suggestions.

Keywords: safety inspection · dangerous goods · safety production management

1 Introduction

Since the 18th National Congress of the Communist Party of China, with the deepening of the "Belt and Road" strategic process, the number of port freight enterprises in China has increased significantly, and the types of port hazardous chemicals handling, storage and transportation have become more diverse, which has brought great challenges to port safety production [1, 2].

At present, the safety production situation of dangerous goods in ports around the world is relatively severe, and safety production accidents still occur from time to time [3]. For example, the explosion accident of super toxic gas in Aqaba Port of Jordan, the chemical explosion accident of container yard in Chittagong Port of Bangladesh, the explosion accident of Xiangshui Chemical Enterprise, and the explosion accident of Tianjin Binhai New Area [4–6]. The safety production accidents that occur from time to time have brought great safety supervision pressure to the relevant regulatory authorities. In order to effectively curb and reduce the occurrence of production safety accidents in port dangerous goods enterprises, the relevant management departments have introduced third-party professional safety inspection agencies to conduct sampling inspections on the safety production and management status of enterprises [7, 8].

R. Lotfi et al. (Eds.): UPRE 2023, AEBMR 253, pp. 152–160, 2023.
https://doi.org/10.2991/978-94-6463-218-7_18

In 2013, Shanghai Jinshan Petrochemical District was the first pilot to carry out the third-party safety inspection, and found 13,700 problems that did not meet the safety production. In the same year, in view of the possible problems of port dangerous goods enterprises and territorial management departments, the Port Bureau of Jiangsu Provincial Department of Transportation entrusted a third-party agency to set up a safety inspection team to conduct spot checks on port dangerous goods enterprises and territorial management departments in the province. More than 370 potential safety hazards were found through spot checks. In 2014, Ningbo Petrochemical Development Zone, drawing on the successful experience of Shanghai Jinshan Petrochemical, guided 66 dangerous goods enterprises to carry out third-party safety inspection. In 2017, the port and shipping administrations of Hainan Province and Zhoushan City commissioned third-party security agencies to conduct security inspections on port dangerous goods enterprises in the province and the city [9]. From 2016 to 2022, Zhejiang Port and Shipping Administration introduced third-party professional institutions to participate in the safety inspection of dangerous goods in ports through the government's purchase of socialized services, and carried out production safety inspections on 85 port dangerous goods enterprises in the province [10].

Through the third-party professional institutions to carry out the production safety inspection of port dangerous goods enterprises, it not only alleviates the regulatory pressure of the management department, but also enables enterprises to more accurately understand their own problems and deficiencies in safety production and management, and effectively improves the production safety level of enterprises. However, the management department cannot intuitively understand the overall situation of the production safety of port dangerous goods enterprises. Based on this, this paper analyzes the production safety status of port dangerous goods enterprises by sorting out the data obtained from the inspection, so as to help the relevant departments better grasp the safety production and management status of port dangerous goods enterprises.

2 Zhejiang Port Dangerous Goods Enterprises Inspection in 2022

At present, there are 276 port dangerous goods enterprises in Zhejiang Province, and 1236 tanks have been approved. The safety supervision tasks of relevant management departments are very heavy. Therefore, in order to grasp the safety production and management status of port dangerous goods enterprises in Zhejiang Province in time, the port and shipping management department of Zhejiang Province has selected 20 port dangerous goods enterprises in the province to carry out third-party safety inspection.

2.1 The Basic Situation of 20 Port Dangerous Goods Enterprises Being Sampled

Among the 20 dangerous goods enterprises sampled, there are 25 berths of dangerous goods with different tonnage levels. The specific berth level distribution is shown in Fig. 1.

According to Fig. 1, the berth level of the sampled enterprises is basically between 1000 and 50,000 tons, of which the number of berths between 1000 and 10,000 tons is the largest, with a total of 12.

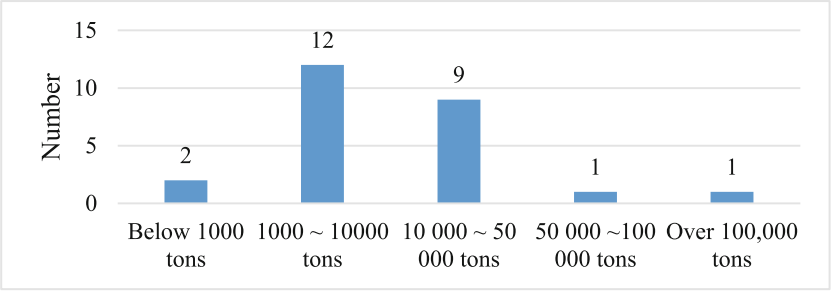

Fig. 1. Distribution of berth grade of sampled enterprises

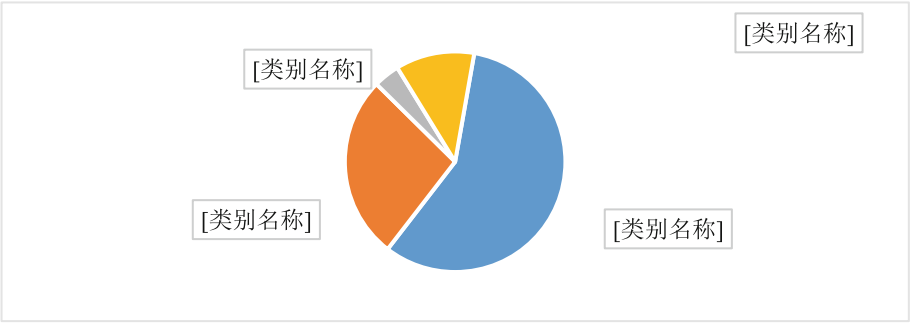

Fig. 2. Distribution of major hazard sources of dangerous goods in port

Among the 20 port dangerous goods enterprises sampled, there are a total of 26 hazard sources, including 15 major hazard sources of port dangerous goods at the first level, 7 major hazard sources of port dangerous goods at the second level, 1 major hazard source of port dangerous goods at the third level, and 3 major hazard sources of port dangerous goods at the fourth level, as shown in Fig. 2.

A total of 74 kinds of goods were involved in the 20 dangerous goods enterprises, including type 2 compressed gas, type 3 flammable liquid, type 4 flammable solid, type 8 corrosive substances and type 9 miscellaneous dangerous substances and articles, a total of 5 categories. Among them, the third category of flammable liquids, the largest number of 36. The classification of dangerous goods approved for handling is shown in Figs. 3 and 4.

Among them, the most approved cargoes for loading, unloading, storage and transportation are diesel, gasoline and fuel oil, as shown in Fig. 4.

2.2 Results of Safety Inspection of Dangerous Goods Enterprises in Zhejiang Port in 2022

In view of the hidden dangers and problems found in the sampling inspection of equipment and facilities, loading and unloading operations and related internal industry data within the supervision scope of the port and shipping department, the hidden dangers

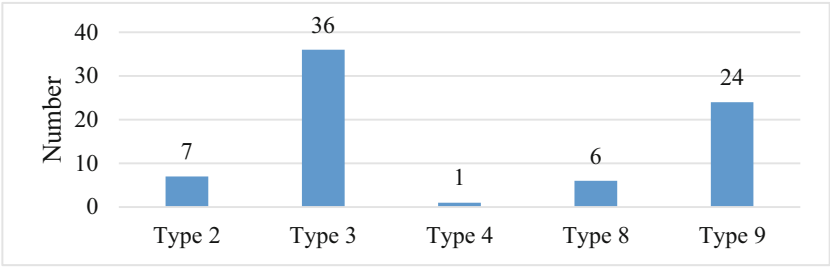

Fig. 3. Distribution of dangerous goods types in enterprise operation

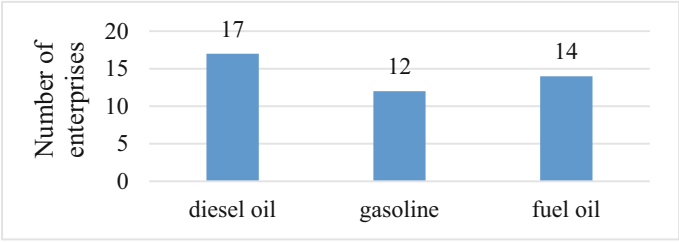

Fig. 4. Enterprises are allowed to handle and store the main types of goods

and problems found in the sampling inspection are divided into five categories: major accident hidden dangers, P1, P2, P3 and P4 according to the severity and difficulty of rectification. Among them: major accident hazards refers to the hazards and the difficulty of rectification, requiring partial or total shutdown, and after a certain period of time to rectify the treatment can be eliminated, or due to the influence of external factors that make it difficult to eliminate the production and operation units themselves, the judgment is based on the "Guidelines for Determining Major Accident Hazards in Dangerous Goods Port Operations" (Jiaobanshui [2016] No. 178); the P1 category refers to the hidden dangers that are difficult to eliminate by the enterprise itself due to serious harm or external factors; p2 refers to the general degree of harm, which may lead to personal injury or economic loss, and can immediately rectify the hidden dangers after discovery; p3 refers to the problem that enterprises do not meet the current norms but meet the norms of the construction period and the rectification is difficult due to the implementation of the new norms; the P4 refers to the countermeasures proposed by the inspection team for enterprises to improve their safety production management level from the perspective of improving intrinsic safety and refined management, and it is recommended that enterprises carry out rectification under conditions.

According to the results of third-party safety inspections, a total of 816 hidden dangers were found in 20 port dangerous goods enterprises sampled in 2022, with an average of about 41 per enterprise. Among them, there are 2 major accidents, 16 P1 hidden dangers, 731 P2 hidden dangers, 2 P3 hidden dangers and 65 P4 hidden dangers, as shown in Fig. 5.

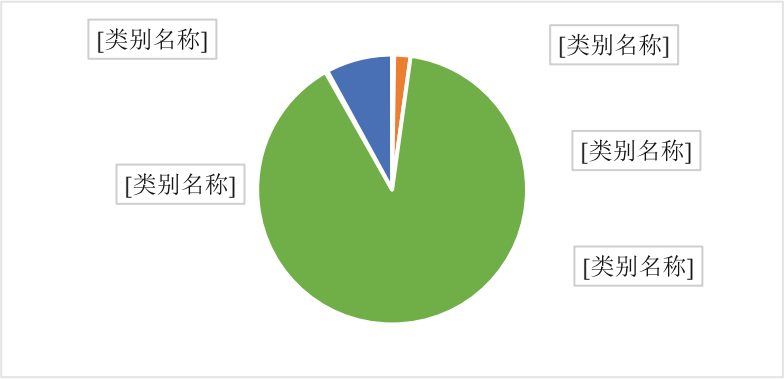

Fig. 5. Proportion of hidden dangers

In order to master the safety knowledge level of operators and safety management personnel in port dangerous goods enterprises, the safety production personnel and management personnel of 20 enterprises sampled were tested, and the test results were shown in Fig. 6.

According to the average score of the enterprise ability test in Fig. 6, the total average score of 20 enterprises is about 76 points, less than 80 points. The average score of each enterprise's ability test is 97 points, and the lowest is only 63.65 points.

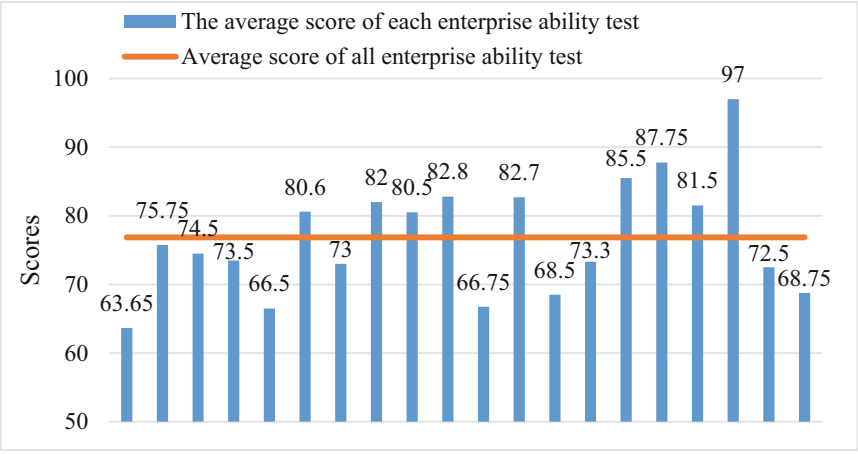

Fig. 6. Average score of each enterprise capability test

3 Analysis of Safety Inspection Results of Port Dangerous Goods Enterprises in 2022

3.1 The Deficiency of Port Dangerous Goods Enterprises in Zhejiang Province

Combined with the basic situation and inspection results of 20 sampled enterprises, it can be seen that the port dangerous goods enterprises in Zhejiang Province generally show a controllable state in production safety, but there are still some weak links that need to be improved.

(1) The safety production management level of some port dangerous goods enterprises is still insufficient. According to the third-party inspection results, a total of 816 safety hazards were found in 20 inspected enterprises, with an average of 41 safety hazards found in each enterprise.
(2) The safety knowledge level of some enterprise operators and safety management personnel needs to be improved. According to the ability test results of Fig. 6, the average score of 5 enterprises in the personnel ability test is less than 70 points, while the total average score of the 20 enterprises sampled is only about 76 points, and the overall level of test results is low. It shows that the safety knowledge of enterprise operators and safety management personnel is low, and it also shows that the enterprise does not pay enough attention to safety education, and does not regard safety education as an important matter of safety production.
(3) The management department is still insufficient in safety supervision. In the third-party inspection, it was found that there were many potential safety hazards in the enterprise, and in the safety knowledge ability test, it was also found that the safety knowledge level of some enterprise operations and management personnel was insufficient. On the one hand, it reflected that the enterprise paid less attention to safety production. On the other hand, it also showed that the management department still had deficiencies in safety supervision and could not supervise the enterprise to achieve safety production well.
(4) The common problems of the industry are more prominent, and the relevant norms are not in place. The inspection found that most enterprises have the same type of problems, mostly concentrated in the equipment and facilities are not effectively grounded, logo fading and safety management system is not perfect and so on. These aspects are supported by corresponding laws and regulations, but have not been implemented.

3.2 Analysis of the Causes of Hidden Dangers

(1) The rules and regulations of enterprises are not combined with their own reality. At present, some enterprises seek third-party institutions to assist in the formulation of rules and regulations, which leads to the over-templated rules and regulations, lack of integration with the actual situation of enterprises, and difficult to implement in the production process.
(2) Enterprises are not strictly managed in accordance with the rules and regulations. Some enterprises put the written rules and regulations on the shelf, and did not strictly abide by the corresponding rules and regulations in the actual production process, resulting in potential safety hazards.

(3) The daily inspection personnel of the enterprise are formalistic and the inspection is not careful. In the face of repetitive work, inspectors are prone to slackness, and there is a problem of 'darkness under the lamp' for the hidden dangers around them.
(4) There is a fluke mentality among enterprise safety management personnel. Some enterprise managers take a laissez-faire attitude towards the hidden dangers found, believing that as long as more attention is paid to production, there will be no problems.
(5) The requirements of the new specification have not been implemented in time. With the continuous development and progress of the industry, the relevant norms are constantly updated and progressed, which requires enterprises to implement the new norms in a timely manner. However, some enterprises fail to implement the requirements of the new norms in a timely manner due to cost and other reasons, resulting in hidden dangers.

4 Countermeasures and Suggestions

(1) Enterprises should strengthen personnel safety education and training. The third-party safety inspection has exposed the shortcomings of enterprises in safety education and training, and the safety knowledge of enterprise operators and safety managers is not strong. Therefore, it is necessary to strengthen the safety education and training of enterprise operators and safety management personnel, and establish a sense of safety responsibility to reduce the hidden dangers caused by the unsafe behavior of personnel.
(2) Enterprises should improve and perfect the corresponding rules and regulations according to their own actual situation. By further improving the rules and regulations of the enterprise, it can guide the operators to engage in production safely and reduce the occurrence of hidden dangers.
(3) The management department should urge enterprises to rectify the hidden dangers found in time and implement the closed loop. During the inspection, it is often found that the same hidden dangers occur repeatedly in the enterprise. This is mainly because the enterprise has not rectified the problems in time after being checked out, and the management department has not implemented the closed-loop management after finding the hidden dangers, resulting in the hidden dangers found not being dealt with.
(4) The management department formulates relevant guidelines to guide enterprises to rectify the hidden dangers found. Some enterprises are willing to rectify hidden dangers after discovering hidden dangers, but limited by reasons such as insufficient professional level, they are unable to start rectification of hidden dangers, and may even cause greater hidden dangers or even accidents due to the wrong way of rectification.
(5) Management departments should continue to strengthen the application of third-party institutions in the safety inspection of port dangerous goods enterprises. At present, the number of port dangerous goods enterprises is large, and it is difficult to take into account the whole industry only by the management department itself. Therefore, it is very necessary to carry out safety inspection through third-party institutions. At the same time, third-party institutions are more mobile and suitable for cross-city services.

(6) Further improve the relevant laws and regulations. At present, there are many laws and regulations related to the safety of dangerous goods in ports. Different norms may make different judgments on the same situation, and it is difficult for enterprises to judge the norms that should be based on. Therefore, it is suggested that the management department can integrate some regulations and norms, so as to facilitate the learning and application of norms by relevant enterprises and practitioners.

5 Conclusions

Through the third-party safety inspection in 2022, the safety production situation of port dangerous goods enterprises in Zhejiang Province is generally stable and good, but there are still prominent contradictions between the scale of dangerous goods and the supervision force, the safety risk and the safety production technology, the enterprise safety responsibility and the safety management ability, and the port operation safety supervision has a long way to go. Firstly, we should strengthen safety education, improve the quality of safety management personnel and operators. Secondly, we should strengthen the supervision and management of enterprises, and urge them to do a good job in safety. Thirdly, continue to carry out third-party safety inspections to help enterprises find and solve the hidden dangers.

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