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Research on maritime unpacking inspection mechanism of ship-borne dangerous goods containers : take Fujian MSA as an example

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RESEARCH ON MARITIME UNPACKING INSPECTION MECHANISM OF SHIP-BORNE DANGEROUS GOODS CONTAINERS —— TAKE FUJIAN MSA AS AN EXAMPLE

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Declaration

I certify that all the material in this dissertation that are not my own work have been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

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Abstract

Title of Dissertation: Research on Maritime Unpacking Inspection Mechanism Of Ship-Borne Dangerous Goods Containers

—— take Fujian MSA as an example

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Shipping is the most important way of global trade and transportation, and container ships serve as important means of transportation in international trade due to its closure and convenience, which leads some shipping employees falsely report or conceal that dangerous goods are shipped as ordinary goods for economic reasons. This behavior brings great potential danger to the safety of ships and crew, and even threatens the safety of ports. In recent years, the maritime departments of major ports at home and abroad have made great efforts to study the supervision of ship-borne containers, put forward some problems found in law enforcement practice, and corresponding solutions. Taking Fujian Maritime Safety Administration as an example, this dissertation analyzes the problems and reasons existing in the unpacking inspection mechanism of dangerous goods containers on board and puts forward corresponding solutions.

KEY WORDS: ship-borne container, dangerous goods, maritime department, unpacking inspection

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List of Abbreviations

IMDG	International Maritime Dangerous Goods
MSA	Maritime Safety Administration

Chapter 1 Introduction

1.1 Background and significance of the study

With the development of modernization and industry, the demand for various chemical raw materials in production and life is increasing and a variety of new chemical products are emerging. There are many dangerous goods in these chemical raw materials and chemical products. Shipping is the most important mode of global trade and transportation, and container ships are important means of transportation in international trade because of their high efficiency and convenience. At present, most of the dangerous goods in global trade are carried by container ships. (Tang, Wu, Zhang, & Han, 2016)

Because containers are closed and convenient, some shippers, for their own economic interests, disregard the safety of others and falsely report or conceal that dangerous goods are shipped as ordinary goods. This behavior brings great potential dangers to the safety of ships and crew and has been repeatedly prohibited. False reporting of dangerous goods in containers on board is not only related to the safety of transport vessels, but also to the safety of ports.

To deal with accidents, the most important thing is to prevent them before they happen. The maritime department is important to defend and supervise ship-borne container transportation. The main supervision measures include declaration of goods and ships, on-site inspection, administrative punishment, etc.

1.1.1 Review of concealment and false reporting of dangerous goods of major accidents by container ships

In recent years, container accidents of dangerous goods on board have occurred from

time to time, resulting in serious consequences. For example,

In April, 2021, "INTERASIA CATALYST" caught fire in the waters near Malaysia. The ship carried Chinese export goods and was anchored in many Chinese ports. Although the specific cause of the fire has not been officially announced, people in the industry suspect that it is a false declaration of container cargo. (Netease, 2021)

In January 2021, "COSCO PACIFIC" caught a container fire near Port Klang, which interrupted the ship`s voyage. COSCO Shipping has identified that the cargo causing the container fire is lithium battery, which is concealed as ordinary parts by the owner. (network, 2020)

On March 6, 2018, M/V Maersk Honam burst into a fire in the Indian Ocean, killing four crew members, which was called "the worst container ship fire in history". People in the industry generally speculate that it is related to false reporting of dangerous goods. (Bulletin of shipping transactions, 2018)

1.1.2 Data analysis of maritime unpacking inspection of ship-borne containers in Fujian MSA in recent years

Fujian Province is rich in port resource with a coastline of 3752km, ranking second in China. By the end of 2019, the number of productive berths in coastal ports in the province has reached 481, and the number of berths above 10,000 tons has reached 185. In 2020, the port cargo throughput of Fujian Province reached 621 million tons, up 4.5% year-on-year, and the container throughput reached 17.26 million TEUs. Fujian Province is located in the southeast coastal area of China. The port group consists of Xiamen Port, Fuzhou Port, Quanzhou Port, Ningde Port, Meizhou Bay Port, Zhangzhou port and other important ports. (Xu, 2015)

Table 1 Annual Statistics of Declared Handling Quantity of Dangerous Goods in Fujian Port					
year	2016	2017	2018	2019	2020
Handling capacity of dangerous goods (100 million tons)	0.78	0.82	1.31	1.74	1.75
Source: Fujian MSA, 2021. Work data statistics					

According to Table 1, the annual statistics of the declared throughput of dangerous goods in Fujian ports show that in recent years, the throughput of dangerous goods carried by ships in the jurisdiction of Fujian Maritime Safety Administration has increased year by year.

Table 2 Annual statistical table of the number of false and concealed cases of ship-borne containers in Fujian port					
year	2016	2017	2018	2019	2020
Investigate and deal with false and concealed cases of dangerous goods containers on board (starting)	22	32	34	38	24
Source: Fujian MSA, 2021. Work data statistics					

According to Table 2, the annual statistics of the number of cases investigated and dealt with by ship-borne containers in Fujian ports show that in recent years, containers with false reports will be found in the on-site unpacking inspection of Fujian Maritime Safety Administration every year, and the number of such cases basically shows an upward trend year by year. It can be seen that the maritime unpacking inspection of ship-borne containers still has a long way to go.

1.2 Research status at home and abroad

In recent years, the maritime departments of major ports at home and abroad have made great efforts in the supervision of ship-borne containers, raised the problems

found in law enforcement practice, and put forward corresponding solutions.

1.2.1 Problems in the supervision of ship-borne containers

Generally speaking, the problems found are not only the common problems of law enforcement in maritime field, such as clear law enforcement basis and standardized investigation and handling but also the individual problems of ship-borne container supervision, such as the selection of target containers and the financial guarantee during the unpacking inspection of target containers.

Although the maritime department actively innovates and develops the information inquiry system on cargoes in container, irresponsible shippers or cargo owners have an opportunity to falsely report and conceal dangerous goods because they have the characteristics of information intercommunication and difficulty in obtaining original data in the whole process of raw material production, processing, storage and sales and transportation. It is extremely urgent to study the traceability management of dangerous goods in ship-borne containers. (Qian & Zuo, 2020)

In the actual operation process of sampling and sending dangerous goods to ship-borne containers, maritime law enforcement agencies have faced with such problems as how to deal with assessment reports with different conclusions and how to send them to inspection agencies in different places. These problems are related to the insufficient resources allocation of maritime institutions, the security restrictions of domestic logistics industry and the objective need for profit of testing institutions. And they put forward solutions by displaying the key test data in the assessment report, further judging with MSDS and other data, establishing the basic database of chemicals, introducing third-party arbitration and facilitating off-site inspection, etc. (Shi, 2017)

China lacks high-level legislation and systematic top-level design for the management of dangerous goods transportation. And part of the management law has been made over 30 years, which is no longer suitable for the current social and economic management model; On the other hand, the supervision system of China's dangerous goods transportation management needs to be further improved. (Han, 2017)

There are many problems in the investigation and handling of the illegal acts of false reporting and concealment of ship-borne containers: it is difficult for the maritime departments to obtain the true declaration information of goods, including lack of information sharing among ports and punishment basis for shippers, inconsistent definitions of dangerous goods by different departments, etc. In addition, the investigation and punishment of the illegal acts of false reporting and concealment of ship-borne containers also leads to the overreaction of some carriers, which has a certain impact on the normal maritime trade. (Chen, 2010)

1.2.2 Determination of target container

In fact, the determination of the target container can be classified into one of the safety supervision measures for ship-borne containers, which will be further listed in 1.2.3. However, because of its importance to the supervision of ship-borne containers, it is listed separately again. At present, it is difficult to confirm the goods in containers from its appearance by technical means, and relevant scholars and researchers at home and abroad have done a lot of research on the selection of target containers for dangerous goods containers.

Based on the traceability and difficulty in tampering of block-chain technology, the traceability system of dangerous goods on board is constructed. The maritime department can build a block-chain technology system from the source of dangerous raw materials and give unique codes to these raw materials and finished products, so

as to ensure the integrity and tamper resistance of data. The link improves the transparency of information in the process of purchasing, producing, testing, transporting and selling the dangerous goods of ship-borne containers, meets the needs of the maritime department to fully and accurately know the dangerous goods information when carrying out the inspection of ship-borne containers and provides an effective solution to the traceability management of ship-borne containers. (Qian & Zuo, 2020)

It is necessary to comprehensively analyze the reasons of accidents while checking the selection of target containers and organically combine risk factors with container selection factors to form a scientific and effective decision-making method for selecting target containers: analyzing system risk factors through accident tree analysis to determine the accident factors of dangerous goods on board in container transportation; By means of information technology, the risk factors of dangerous goods in ship-borne containers are combined with port EDI information, and 19 container selection factors are systematically found out. Finally, the container of dangerous goods with suspicious high risk is screened out, which reduces the scope of manual screening, the workload of supervision and improves its efficiency. (Fang, Shao, & Wu, 2019)

Combined with D-S theory, this dissertation studies the maritime transportation of dangerous goods containers, tries to introduce D-S theory (Dempster-Shafer evidence theory) to the risk assessment of safe transportation of dangerous goods containers and constructs a risk assessment model of ship-borne dangerous goods containers based on human-ship-environment-management-cargo. The model has a certain reference value for the evaluation of the safe transportation of dangerous goods through containers at sea, and makes an evaluation reference suggestion to the safe transportation and supervision decision of dangerous goods in container ships. (Liu, 2017)

The hierarchical relationships among ship factors, cargo factors and human factors are analyzed specially, a relatively perfect evaluation index system for selecting and unpacking dangerous cargo containers is established, and a general comprehensive evaluation model for dangerous cargo containers is proposed. The results show that the model can effectively realize the target container selection, which provides a new idea for solving the target of unpacking inspection of dangerous goods containers, and makes some suggestions and management measures to reduce the phenomenon of false reporting. (Chen C. , 2015)

Combined with the theory of risk management, the risk assessment models are established to distinguish domestic and international sailing ships. The model comprehensively considers the influence of risk factors such as ship, crew, management, cargo and environment on the safety of ship-borne dangerous goods transportation, defines the risk index of ship-borne dangerous goods accidents, and forms a complete set of risk assessment methods. At the same time, according to the risk assessment results of ships, they are divided into low-risk ships, medium-risk ships and high-risk ships. (Zhang, 2015)

With reference to successful experience of manually searching for dangerous goods containers that are falsely reported or concealed, the target container evaluation index system is established. At the same time, a non-linear target container evaluation model is established by using neural network evaluation method, which is verified by an example. The results show that the target container evaluation model established by using BP network technology can effectively identify the target container selection, providing a brand-new idea for solving the problem of selecting the target container for unpacking inspection of dangerous goods containers. (Qiu, Chen, Wei, & Xie, 2010)

A three-step unpacking process is proposed: determining the target container, unpacking on site and investigating and handling. In the process of determining the

target container, by analyzing the cases investigated and dealt with in the past, it is proposed to grasp the "three key" links of key routes, key goods and key units. In addition, implementing a "blacklist" system is to enhance management deterrence. (Chen W. , 2010)

A decision tree model is proposed to analyze each situation, select the inspection target container and combine with sensors to further optimize the screening method. (Boros, Fedzhora, Kantor, Saeger, & Stroud, 2006)

1.2.3 Solutions to safety supervision of ship-borne containers

In addition to screen the target containers listed separately in 1.2.2, there are also many explorations on the safety supervision solutions to ship-borne containers in recent years.

Based on the Principle of Systematology Applied to Safety, they drew lessons from the solutions to the problem of false reporting of dangerous goods by air, railway and road, and put forward solutions and suggestions to solve the problem of false reporting of dangerous goods containers by water transport, which provided new ideas and ways to solve the problem of false reporting of dangerous goods containers by water transport. (Peng & Geng, 2020)

Through the analysis of each link that affects the government safety supervision of dangerous goods on board ships, the risk points and reasons of each link are found out, and the solutions are put forward to improve the government safet supervision of dangerous goods on board ships by giving full play to the government planning guidance function and the effectiveness of joint supervision, improving the supervision level of maritime departments and government legal and regulatory system and increasing government subsidies. (Hao, 2019)

Taking the experience of dangerous goods container inspection accumulated by the Marine Department of Zhangjiagang Maritime Safety Administration in recent years as an example, Yin briefly introduces the main points of container inspection; look at the outer packaging of the goods, check the product specifications and verify the safety technical specifications. This introduction provides some ideas and suggestions for maritime departments to improve the efficiency of investigation and punishment of dangerous goods container concealment. (Yin, 2015)

Combined with the natural environment of Qingdao Port and the characteristics of dangerous goods transportation on board, it proposes a new method for scientific supervision of dangerous goods on board. According to the ships carrying dangerous goods with different risk levels, the corresponding management measures have been formulated: strengthening the declaration audit and electronic cruise for low-risk ships, carrying out targeted inspection for medium-risk ships, and strictly supervising high-risk ships throughout the whole process. In addition, two measures, i.e., strengthening industry management and promoting credit classification services, have been formulated, and the long-term management mechanism of dangerous goods on board Qingdao Port has been improved. (Zhang, 2015)

Combined with the current situation of maritime dangerous goods transportation supervision at home and abroad, and the demand analysis of maritime dangerous goods supervision system, a dangerous goods declaration and approval system is designed to meet the needs of maritime work, including the overall deployment design, business process design, functional framework design, business function design and so on. And Han realized the function of development and system test of maritime dangerous goods supervision system. (Han F. , 2015)

In the supervision of ship-borne containers, it often happens that it takes a long time to leave the goods at the dock because of the special procedures for inspection and punishment. This has caused great economic burden for shipping enterprises under

the financial crisis. Combined with the particularity of maritime affairs, for better supervision and service, this dissertation puts forward a set of mature and feasible bank guarantee mode, briefly analyzes its nature and matters needed our attention and gives the recommended format, which provides guidance for law enforcement personnel in unpacking inspection and other aspects involving guarantee in law enforcement process. (Xuan, 2010)

In view of the problems existing in the unpacking inspection of ship-borne containers, this dissertation puts forward the following solutions: increase the training of law enforcement personnel and the equipment of law enforcement facilities, establish an information exchange platform for concealing transport units among maritime systems, update and publish the list of dangerous goods which had not been listed separately, strictly investigate all links to identify responsibilities, carry out joint rectification with local competent departments, and emphasize that carriers should follow the guidance to ensure a safe and healthy development of maritime trade. (Chen W. , 2010)

It is mentioned that it is necessary to improve and deepen the cooperation mechanism with relevant functional departments. Many units and links are involved in the transportation of dangerous goods by water, and their responsibilities have in common with others in management. Strengthening communication and cooperation with other departments is an effective way to improve the effectiveness of supervision. It is necessary to actively communicate and coordinate with customs, port administrative departments, port public security, ports and docks, seek the cooperation of relevant departments in the chain of dangerous goods management, broaden the supervision ideas, carry out joint law enforcement actions, form joint supervision efforts, and strengthen the supervision of dangerous goods by water. (Lin & Zhou, 2008)

1.3 Main work of this research

1.3.1 Research ideas

In this dissertation, it analyzes the current situation of supervision of ship-borne containers by maritime institutions and the problems existing in the whole process. Based on the research status at home and abroad, the ideas of supervision of ship-borne containers are proposed, including the determination of target containers, sampling and inspection, investigation and handling, and other solutions.

The main research contents of this dissertation are as follows:

(1) Input analysis on the status of safety and research status of marine transportation of dangerous goods containers on board;

(2) Analyze the maritime unpacking inspection mechanism of ship-borne containers in Fujian Maritime Safety Administration in recent years

(3) Analyze the problems faced by the maritime unpacking inspection of dangerous goods containers on board and the reason of the problems;

(4) Based on the above analysis, this dissertation puts forward solutions of maritime unpacking inspection of ship-borne dangerous goods containers and makes some suggestions to improve the effectiveness of maritime unpacking inspection of ship-borne dangerous goods containers;

(5) Draw conclusions and put forward prospects.

1.3.2 Research methods

This dissertation mainly adopts the following methods to study:

(1) Literature analysis. Through academic engines such as CNKI, we collected

academic resources on maritime safety supervision of dangerous goods containers on board, mainly on maritime unpacking inspection, studied the latest research results on safety supervision of dangerous goods on board in monographs, laws and regulations and documents, found out the weak links in supervision and analyzed the safety supervision of dangerous goods on board in Fujian.

(2) Combination of practical investigation and theoretical analysis. Make full use of the convenience of supervision of dangerous goods on board in work, and study and practice the problems found in theoretical analysis and comparative analysis in practice. Through the investigation of the units and employees involved in the transportation of dangerous goods on board ships in Fujian, the problems existing in cargo transportation and government management are found out, and the solutions are studied together with the relevant units and personnel.

Chapter 2 Introduction of knowledge

2.1 Basic concepts

2.1.1 Dangerous goods in containers on board ships

(1) Containers and container ships

According to CSC, container refers to a large-scale loading container with certain strength, rigidity and specifications, which is easy to turnover, durable, stable and unique due to its container number. Because of these characteristics of container, it has obvious advantages in transportation, including high loading and unloading efficiency, less loss of goods, and economical packaging cost. Therefore, container has become a popular transportation mode in the modern world.

Container ships refer to the ships that can be used to load containers. Container ships not only have the characteristics of container freight transportation but also have the characteristics of fast speed, high loading and unloading efficiency like fast ships. At present, maritime container transportation has become a modern transportation mode with centralized logistics and efficient ports. Due to the rapid development of multimodal transport, door to door transportation has become the main mode of container transportation.

(2) Dangerous goods on board

According to rough statistics, more than 50% of global container transportation belongs to door-to-door transportation. With the development of containerization and the expansion of global logistics services, the proportion of door-to-door transportation will continue to increase.

According to the Regulations on Safety Supervision and Administration of Dangerous Goods Carried by Ships, dangerous goods carried by ships include packaged dangerous goods, liquid bulk dangerous goods, solid bulk dangerous goods, bulk oil, bulk liquid chemicals and so on.

Shipping dangerous goods by ship-borne container is a kind of dangerous goods carried by ship, which belongs to packing dangerous goods. Therefore, this dissertation only discusses the packaged dangerous goods, that is, the packaged dangerous goods listed in the dangerous goods list in Part 3 of IMDG code. This will be discussed in Section 2.2.

2.1.2 Container transportation process of dangerous goods on board

The process of transporting goods by ship-borne containers means that the carrier packs the goods in the shipper's warehouse and transports them to the consignee's warehouse, which mainly adopts the whole-container loading mode and the door-to-door handover mode. Personnel involved in the whole transportation process need to have corresponding qualification certificates. First, the shipper books the shipping space with the carrier. After the carrier confirms the order, the shipper takes the container. And the packer supervises the packing of the goods and issues the packing certificate. And then, the declarer declares with the certificate, and then the carrier receives the goods and transported the containers to the freight station. Before the ship arrives at the destination port, the carrier will submit the documents to the maritime department of the destination. After receiving the approval, the carrier will unload the dangerous goods container to the consignee and return it to the container.

2.1.3 Maritime unpacking inspection

Safe transportation of dangerous goods containers on board ships involves many regulatory agencies and various regulatory methods. Maritime unpacking inspection is one of the methods for maritime departments to carry out on-site supervision. The following table shows the responsibilities of maritime department, port department, customs and other departments.

Table 3 Responsibilities of the goods regulatory departments

MSA	Port	Customs
Unified supervision of water traffic safety. Prevent ship pollution, ships carried dangerous goods must remember to declare	Examine and approve the operation of dangerous goods in ports. Establish and improve the emergency rescue system, administrative law enforcement, supervision and inspection of major production safety accidents in ports	Acceptance of import and export goods applications, inspection of goods, collection of customs duties and other taxes, and investigation of smuggling, etc. Implementation inspection and quarantine, identification, supervision and management of entry-exit dangerous goods

The maritime administrative department is the competent authority to maintain the safety of water traffic and prevent ships from polluting waters. In recent years, the maritime department has continuously strengthened the investigation and punishment of the illegal act of falsely reporting and concealing dangerous goods containers on board ships. Maritime unpacking inspection refers to the on-site unpacking inspection of ship-borne containers determined by some selection mechanism and carried out according to certain regulations. The contents of maritime unpacking inspection include checking whether the appearance of the container and the goods in the container meet the requirements of safe transportation, and investigating and

handling illegal acts. The details will be discussed in Chapter 3.

2.2 Reasons of false reporting and concealment of dangerous goods in ship-borne containers

In addition to the closure of container, there are various reasons for false reporting of dangerous goods in ship-borne containers. It has been analyzed in 2.1.2.The process of transporting goods by ship-borne containers involves shippers, carriers, packing inspectors, declarers and many others. Analyzing the causes of false reports in each link is helpful to understand the problems deeply and put forward corresponding measures.

2.2.1 Economic reasons

(1)Pursuing profit

In the transportation of goods by sea, it is a relatively safe and reliable mode to transport dangerous goods in the form of packaging. The reason why it occurs false reporting and concealment is that they only pursue interests and neglect safety. The freight of dangerous goods is 50%-100% higher than that of ordinary goods, and the transportation cost of a refrigerated container of dangerous goods is 150%-200% higher than that of an ordinary container of goods. Some enterprises lack the awareness of safe production and fail to put the main responsibility of safe production in place. In pursuit of economic benefits, they sacrifice safety and try to reduce costs and pursue profits.

(2)Evading the supervision

At present, there are many relevant government departments involved in the

management of dangerous goods, including maritime affairs, ports, customs, emergency management and other departments. In order to improve the efficiency of goods circulation and reduce formalities, some shippers in enterprises take chances and try to reduce costs and pursue profits.

(3)Pursuing rapid turnover of ports

Optimizing the business environment is the focus of government work in recent years, and enterprises and even local governments focus on regional economic development. Improve the turnover rate of ports plays a significant role in the competitiveness of local ports. Therefore, in some periods of intensive shipping schedule, port enterprises pay more attention to port planning, packing quantity verification and pursuing efficiency and logistics speed, which will inevitably pay less attention to the name and nature of the goods on board.

In addition, if the maritime unpacking inspection is carried out, it will take extra time for the shippers from container extraction to unpacking inspection. If sampling, inspection and evidence collection are involved, the waiting time will be longer. If the unpacking inspection of a port is strong, it is likely that the subsequent shippers will choose to load and unload goods near the port, which will affect the short-term competitiveness of the port. From this point of view, the maritime unpacking inspection may face some resistance.

2.2.2 Reasons of shipping practitioners

Ship-borne container transportation involves many links in the industrial chain, including owners, shippers, carriers, etc. Some employees have weak sense of responsibility, lack of professional knowledge of dangerous goods, and even deliberately violate the law for personal interest. According to the different links in

the container transportation of dangerous goods on board, the employees who have problems mainly include shippers, declaration officers of dangerous goods on board (hereinafter referred to as "declarers") and on-site inspectors of container packing (hereinafter referred to as "inspectors")

(1) Shipper: Shipper generally refers to the owner or his agent. According to the regulations, the shipper should truthfully inform the nature of the goods, and provide the goods and relevant documents that meet the requirements. In practice, it is found that there are generally two reasons for shippers to make false reports. They make false reports for economic benefits and lack professional knowledge. Generally, shippers are less directly involved in transportation, but entrust freight forwarders at different levels. As far as agents are concerned, due to the fierce competition in the agency industry, some agents make trouble to get orders and act with shippers to make false reports. Some agents have insufficient sense of responsibility that makes them fail to carefully examine documents and information and check the nature of goods. In practice, most shippers and their agents know each other, and only a few cases are when shippers fail to inform freight forwarders.

(2)Declarers and Inspectors: On-site container inspectors play an important role in ensuring the safety of dangerous goods container transportation. According to the Measures for the Administration of Declarers of Dangerous Goods on Board Ships and Inspectors on Container Packing Site, there are requirements for the declarers and inspectors to be employed by the units, and they shall not be employed by more than two declaration or packing units at the same time. Therefore, it is difficult to prevent reporting officers and inspectors from providing convenience for false reporting and concealment of ship-borne containers for the benefit of business units.

(3) Carrier: Carrier generally refers to the ship (or its agent). In the practice of maritime transport, it often happens that the carrier is cheated by the shipper and does not know the nature of the goods, which generally needs to be identified by contracts.

In addition, there are cases where the carrier and the shipper shield each other. According to the Regulations on the Safety Management of Dangerous Chemicals, carriers of dangerous goods by sea need to obtain qualifications. Some private ship-owners pay a certain fee every year by attaching their ships to shipping companies with dangerous goods transportation qualifications, and they have also obtained the qualification of dangerous goods carriers. However, the owner's ship is not qualified to transport dangerous goods, and the crew employed by him lacks knowledge about dangerous goods on board.

2.2.3 Present situation of dangerous goods facing maritime restrictions

Many dangerous goods must be transported in the form of ship-borne containers. The total value of goods carried in containers is much higher than the value of dry goods in bulk. However, due to the characteristics of dangerous goods transportation, the shipping container transportation channel of dangerous goods is narrow.

Internationally, with the enforcement of the International Ship and Port Facility Security Code, some developed countries, such as the United States, have strict inspection of dangerous goods in containers on board, which has increased many extra costs. Therefore, many shipping companies have made it clear that they will not accept dangerous goods in containers.

In China, after the "812" explosion accident in Tianjin Port, some ports have refused and restricted the collection of dangerous goods containers, and suspended the loading and unloading of dangerous goods containers one after another, which cause blockage of dangerous goods transportation channel.

2.3 Rules of application

At present, the international conventions and rules relates to the international packing of dangerous goods by sea. China formally approved to join or accepted by default, including the 1974 International Convention for the Safety of Life at Sea and its corresponding amendments, the 1978 Protocol to the 1973 International Convention on Pollution Caused by Ships at Sea and its corresponding amendments, etc. The applicable rules are IMDG code, CTU codes, etc.

At present, the international conventions and protocols related to the international packing of dangerous goods by sea, which China formally approved to join or accepted by default, include the 1974 International Convention for the Safety of Life at Sea and its corresponding amendments, the 1978 Protocol to the 1973 International Convention on Pollution Caused by Ships at Sea and its corresponding amendments and other international conventions and rules.

2.3.1 International conventions and rules

(1) Chapter VII of SOLAS Convention

The revised 1974 International Convention for the Safety of Life at Sea (SOLAS) covers all aspects of maritime safety. Chapter VII of the Convention makes mandatory provisions for the safe transportation of dangerous goods. The transportation of packaged dangerous goods shall comply with the relevant provisions of International Maritime Dangerous Goods Code (IMDG). Therefore, the International Maritime Dangerous Goods Code is regarded as an extension of Chapter VII of SOLAS Convention. See the following in detail.

(2) Annex III of MARPOL Convention

MARPOL (International Convention for the Prevention of Pollution from Ships), 1973, revised by the Protocol of 1978, covers all aspects of preventing and controlling marine pollution from ships. Annex III of the Convention makes mandatory provisions for preventing pollution of harmful substances of packaging by sea, and prohibiting ships from carrying harmful substances except in accordance with Annex III of MARPOL Convention. This Annex III has also been extended in the International Maritime Dangerous Goods Code.

Annex III"regulations for the prevention of pollution of harmful substances carried by sea in packaged form" focuses on standards on packing, marking, labeling, documentation, stowage and quantity limitations. IMDG code is a vehicle of implementation of Annex III

(3) IMDG Code

International Maritime Dangerous Goods Code (IMDG Code) is an expert working group appointed by the Maritime Safety Committee (MSC) of the International Maritime Organization (IMO), which prepares for the close cooperation with the United Nations Expert Committee on the Transport of Dangerous Goods in accordance with the provisions of Chapter VII of the 1960 edition of the International Convention for the Safety of Life at Sea. This rule requires the packing, consignment, stowage and isolation of dangerous goods by sea. China formally joined the International Maritime Dangerous Goods Code on October 1, 1982.

IMDG Code divides dangerous goods into 9 categories and 20 sub-items according to different risks, among which 9 categories are explosives, gases, flammable liquids, flammable solids, natural substances and substances that emit flammable gases in the environment of wetness, oxides and organic peroxides, toxic substances and infectious substances, radioactive substances, corrosive substances, miscellaneous dangerous substances and articles and harmful substances. General packaging can

be divided into three grades according to the degree of danger. The packaging can bear dangerous goods, namely: packaging class I-suitable for containing high, medium and low-risk goods; Packaging class ii-suitable for containing goods with moderate and low risk; Packaging class iii-suitable for containing low-risk goods.

(4)CTU Code

The CTU (Cargo Transport Unit) Code is compiled by IMO, ILO and UNECE. By summarizing the theory and practical measures of cargo packing fastening, it aims to provide safe packing principles for packing operators and relevant training, supervision and inspection personnel. In addition to packing personnel, CTU rules also provide operating principles for all relevant parties in the supply chain, including CTU operators. CTU rules include 13 chapters, 10 by-laws (including 5 appendices), and 10 supplementary information materials.

2.3.2 Domestic laws and regulations

Domestic laws and regulations related to containers of dangerous goods on board ships are formulated with reference to the International Maritime Dangerous Goods Rules of the International Maritime Organization, and under the guidance of China`s existing experience in transporting dangerous goods, which is suitable for China's national conditions and has the international advanced level. This chapter only lists the legal framework related to maritime management of dangerous goods containers on board ships. (Chang, 2017)

（1）Law:

Safety Production Law, Port Law, Maritime Traffic Safety Law, Marine Environmental Protection Law, Administrative Licensing Law and Emergency

Response Law of the People's Republic of China

（2）Legislation:

Regulations on Prevention and Control of Marine Environment Pollution by Ships, Regulations on Safety Management of Dangerous Chemicals, Regulations on Safety Management of Radioactive Goods Transportation, Regulations on Domestic Waterway Transportation and Regulations on Waterway Transportation of the People's Republic of China

（3）Departmental regulations:

Regulations of the People's Republic of China on Safety Supervision and Administration of Dangerous Goods Carried by Ships, Administrative Measures for Safety License of Radioactive Goods Transportation, List of Dangerous Chemicals (2015 Edition) of Port Dangerous Goods Safety Management Regulations, Rules for Waterway Dangerous Goods Transportation, Regulations on Assessment and Qualification Management of Employees in Waterway Transportation of Dangerous Goods, Regulations on Emergency Preparedness and Emergency Disposal of Marine Environment Polluted by Ships of the People's Republic of China, Regulations on Environmental Management of Inland Waters Pollution Prevention and Control by Ships of the People's Republic of China, and Regulations on Safety and Pollution Prevention of Shipping Companies of the People's Republic of China

（4）Normative documents:

Incentives for reporting violations of ship pollution and dangerous goods carried by ships, training and assessment methods for on-site inspectors of dangerous goods carried by containers. Notice of the Maritime Safety Administration of the People's Republic of China on Strengthening the Management of Ship-borne Foreign Trade

Radioactive Goods Transportation, Notice of the Ministry of Transport and other departments on Pesticide Transportation, and Notice on Issuing the List of Hazardous Goods Caused by Marine Pollution

（5）Technology standard:

Safety technical requirements for shipping dangerous goods containers, filling requirements for UN-T50 containers, classification methods and evaluation procedures for hazardous substances in marine packaging environment, technical requirements for containers carrying non-frozen liquefied gases on ships, and inspection procedures for export dangerous goods packaging.

Based on the above laws and regulations, the rules to be observed in the process of transporting dangerous goods by ship-borne containers can be summarized as follows:

(1) When consigning and packaging dangerous goods, the shipper shall properly pack and mark the dangerous goods in accordance with relevant regulations, and notify the carrier of its correct transport name, physical and chemical properties and preventive measures to be taken in written form and truthfully go through the declaration formalities with the maritime administrative department, and shall not make false reports.

(2)The freight forwarder should clarify the relevant agency responsibilities, do a good job in confirming the dangerous goods, and ensure that the dangerous goods are shipped in accordance with the regulations.

(3)Packing inspectors and declarers must hold qualification certificates, and strictly carry out packing inspection and goods declaration.

(4) The carrier should strengthen the examination of dangerous goods. If the

declaration form of dangerous goods is inconsistent with the name of consignment note, it should be verified and corrected in time, so as to avoid the potential safety hazard caused by the false report and false report of the owner or agent.

(5) MSA and other government supervision departments shall, in accordance with their respective duties, do a good job in the supervision and illegal disposal of ships, crew members, ship-borne containers and dangerous goods.

Chapter 3 Analysis of unpacking inspection mechanism in Fujian Maritime Safety Administration

3.1 Brief introduction of unpacking inspection mechanism in Fujian MSA

Screening of target containers and on-site unpacking inspection are important components in the investigation and punishment of false reports of dangerous goods containers on board in Fujian MSA. The maritime department's procedures for unpacking inspection of containers are as follows: determining the spot check of ships and containers, issuing the notice of unpacking inspection of containers, on-site unpacking inspection, determining the nature of goods and releasing containers or administrative investigation.

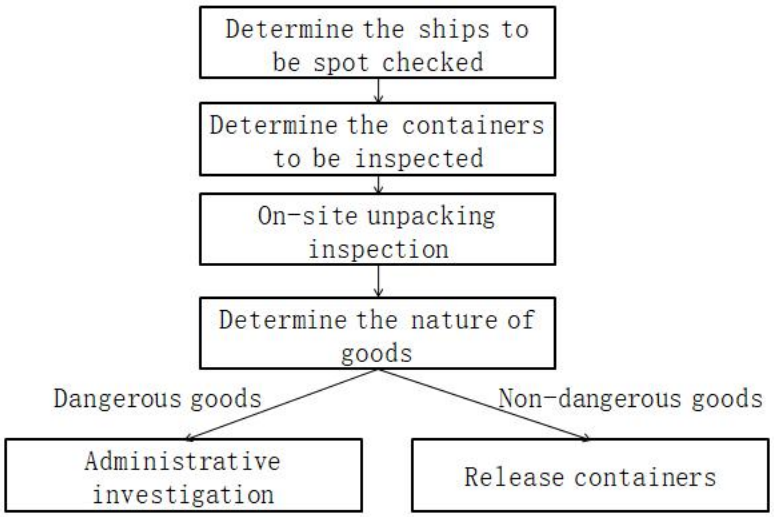

Figure 1 Flow chart of maritime unpacking inspection
Source : Fujian MSA

3.1.1 Selection of target container

Faced with a large number of inbound and outbound ship-borne containers, the selection of target containers is one of the core links in maritime unpacking inspection,

and it has always been the key and difficult point of exploration and research at home and abroad. At present, , the selection of target containers for maritime unpacking inspection of dangerous goods containers on board ships is mainly based on the initiative of maritime departments and supplemented by reports from the masses in the jurisdiction of Fujian Maritime Safety Administration. Generally, the selection of target containers can be divided into the following two situations.

(1) 100% unpacking inspection situations

First of all, for the people to report to MSA that there are false and concealed containers, according to the Measures for Reporting Incentives for Pollution from Ships and Illegal Acts of Dangerous Goods Carried by Ships, any unit or individual has the right to report illegal acts of false reporting and concealment of dangerous goods carried by ships. After investigation by the maritime department, if the report is found to be true, the whistleblower will be rewarded after investigation and punishment of the relevant person. Besides, the container that may be loaded and unloaded dangerous goods for the first time in the port of the jurisdiction must accept unpacking inspection as well.

(2) There are false reporting and concealment

Maritime law enforcement personnel select the target container by checking the inbound and outbound container ships and the goods they carry. Generally speaking, in the selection of target containers, law enforcement officers will select target containers that may have false reports and concealed cases in the respective jurisdictions routes, ships, shippers, etc.

In addition, the maritime department will also focus on unpacking inspection for ship-borne containers supervised by packing inspectors with violation records and declared by reporting units with violation records and the cases with abnormal

appearance, such as damage or leakage, which are found in maritime on-site law enforcement inspections.

After selecting the target container for unpacking inspection, the maritime department will issue a notice for unpacking inspection and timely notify the owner (or his agent), wharf and other parties to prepare for unpacking inspection.

3.1.2 On-site unpacking inspection

(1) On-site unpacking inspection contents

Unpacking inspection includes inspection of external conditions of ship-borne container before unpacking, and inspection of goods in ship-borne container after unpacking. Inspection of external conditions of ship-borne containers includes: Container safety certificate CSC label, seal number, container body condition, etc. After unpacking, the inspection of the goods in the container includes: whether the packing content is consistent with the declaration form, whether the packing form meets the requirements of IMDG, whether the reinforcement and liner of the package in the container are reasonable, whether there are incompatible substances in the container, whether the loading of different goods meets the isolation requirements, whether special protective measures have been taken (needed) and so on.

When maritime law enforcement personnel carry out on-site unpacking inspection, they should do this in the presence of the owner (or his agent), wharf and other parties, and the audio and video records of the whole process should be made through the law enforcement recorder.

(2) Confirming the nature of goods after unpacking inspection

Maritime law enforcement personnel shall, according to the actual situation of container inspection after unpacking, confirm on-site or take samples to confirm whether there is any false report on the goods in the container. At present, the nature of goods in containers is judged mainly by the following methods.

One is to observe the outer packaging of goods. The outer packaging of goods is the first layer visible to the naked eyes after unpacking. Goods produced by regular manufacturers generally have standardized packaging and related signs, which briefly indicate matters needing attention in transportation. In addition to the first layer of packaging, law enforcement personnel should pay more attention to whether the goods in the packaging are consistent with the label names of the outer packaging, so as to eliminate the situation that multiple packages cover up dangerous goods.

Second is consulting the product manuals, including product specifications and safety technical specifications. Product instructions are generally carried with containers. And the owner (or his agent) will generally provide the Chemical Safety Technical Instructions (MSDS) of the goods. Law enforcement personnel can make further judgments according to the product instructions and safety technical instructions.

Third is inspection sampling. In case of suspected dangerous goods that cannot be confirmed and the nature of goods is unknown, maritime law enforcement personnel can take samples on site. Documents are also required for sampling and inspection, which should be signed by the owner (or his agent), wharf and other parties on site for confirmation. During the process, audio and video records will still be made. Send samples to a qualified laboratory for identification as soon as possible after sampling.

3.1.3 Subsequent disposal

After the on-site unpacking inspection, the above inspection contents, including

whether to take samples for inspection and other information, will be recorded in the unpacking inspection form by the law enforcement personnel of the maritime department, and signed by the owner (or his agent), the wharf and other parties on site for confirmation. If it is necessary to score illegal points for the declarer or packer, the reasons and scores shall be indicated and signed by the declarer or packer.

If it is confirmed that there are false reports of dangerous goods, the law enforcement officers of the maritime department will start the investigation procedure of administrative punishment: collect relevant information such as ships, goods and contracts as evidence, make investigation records, and inquiry records and other administrative punishment investigation documents. Similarly, all relevant administrative punishment investigations are recorded in audio and video through law enforcement recorder. And the owner (or his agent) is signed by the investigated object on site for confirmation. False report and concealment of illegal acts will be punished according to the Provisions of the People's Republic of China on Maritime Administrative Punishment. In addition, it will be combined with the discretion standard of administrative punishment, and reported to the legal department of the maritime institution at the next higher level.

3.2 Existing problems

3.2.1 Problems in the Selection Mechanism of Target Container

(1) The accuracy of manual spot check is low.

With the development of large-scale ships, the number of inbound and outbound container ships and onboard containers has increased year by year. Faced with a large amount of application information, the target container can only be selected by spot check. Maritime organizations in most port areas of Fujian jurisdiction mainly obtain manifest information of container freight through shippers or terminals.

However, this method of manual spot check has obvious shortcomings. On the one hand, the choice of target container is random and inefficient; On the other hand, in the process of on-site inspection, it is difficult for law enforcement officers to judge the authenticity of goods names and labels. And some packaged goods, such as canned liquids, cannot be viewed, thus forming no effective means to identify dangerous goods. Therefore, the accuracy of the existing target container selection mechanism is low, which may not only cause false reporting and concealment, but also cause a large number of repeated inspections, waste manpower and resources. Besides, it has no obvious supervision effect.

(2) Problems in selecting target containers through the system.

At present, some ports share information with customs, wharves and other units to obtain the information of container cargo on board. They will compare with the electronic declaration system and select the target container as a reference. However, there are still problems in selecting the target container through the system. First, the system is only applicable to the goods carried by foreign trade ships. And it lacks supervision on the goods carried by domestic trade ships. Second, the existing system also has some shortcoming. The same goods may have different names. At the same time, the software database and discrimination are still short. For example, the same shipment may be different in customs, commodity inspection and maritime declaration systems, just as the same shipment of foreign trade goods uses the name of "aromatic hydrocarbon" in customs declaration and "X oil" in maritime declaration. This may affect the judgment of law enforcement personnel. Third, the information sharing of ship-borne container cargo is insufficient. If it happens, the above-mentioned problems of different commodity names will be more serious. In addition, there is insufficient information sharing among maritime departments in different ports. Although the maritime departments have established a unified declaration platform for dangerous goods on board ships, the declaration and approval information among the maritime departments cannot be shared.

3.2.2 Problems existing in on-site unpacking inspection

(1) Lack of professional inspection site

In addition to the common risks, the unpacking inspection of dangerous cargo containers may be more dangerous than ordinary cargo containers. Therefore, when containers are stacked and opened for inspection, they will face more potential risks. However, at present, there is no special inspection site for dangerous goods containers. Generally, unpacking inspection is carried out by borrowing the warehouses unpacking sites of port areas or related logistics warehousing enterprises. Despite the prevention and control of dangerous goods in terms of staffing and equipment, the above sites still cannot fully meet the requirements of personnel safety protection in unpacking inspection.

(2) Problems existing in sampling in different places for inspection.

After maritime unpacking inspection and sampling, it needs to be sent to a qualified laboratory for testing, and the cost of sampling and testing shall be borne by the maritime institution. In daily law enforcement, it is often necessary to send inspection in different places, which brings many problems. On the one hand, the transportation of dangerous goods by land must comply with relevant laws and regulations, but the maritime institutions themselves are unlikely to meet the requirements. On the other hand, the express logistics industry often rejects the transportation of dangerous goods for safety reasons. In addition, there is no door-to-door sampling service at present.

3.2.3 Problems Existing in Subsequent Disposal

(1) Disposal of dangerous goods containers

After unpacking inspection, although it is confirmed that the target container (hereinafter referred to as the "problem container") has been falsely reported or concealed, the disposal of container with problems is controversial.

First of all, if the problem container is detained, how to choose the detention site and how to safely manage the detention sites are both challenges. In August, 2020, there was a big explosion in Beirut, Lebanon, which caused huge casualties and economic losses. The accident was caused by a batch of dangerous cargo ammonium nitrate stored in the port warehouse. It can be seen that if the site where the problem container is detained, such as the dock, lacks the relevant dangerous goods qualification, it will bring potential safety hazards. Once an accident occurs, we can see that the site is short of adequate emergency equipment. Then, the storage of problem containers will bring new potential safety hazards.

Secondly, if the problematic containers cannot be detained, then the destination of the problematic containers will also be a problem. At present, the regulatory authorities involved in ship-borne containers are generally located in the port area. Once the problematic containers leave the port area, it may be equivalent to release in disguise. Driven by huge economic interests and limited law enforcement resources, it is impossible to identify 100% problematic containers. Owners and other interested parties can easily think that "the law-abiding cost is high and the illegal cost is low", and continue to violate the law after paying a certain fine. Even if we try to supervise the whole process of the problem container, the law enforcement departments involved may far exceed the existing port inspection departments. Even in today's convenient transportation, cross-regional issues should be considered.

(2) Problems existing in investigation and evidence collection

As mentioned in section 3.1.3 above, in case of false reporting or concealment of dangerous goods, law enforcement officers of maritime departments will start the

investigation procedures of administrative punishment such as collecting evidence and making documents. In practice, the confirmation of false reports often needs to wait for the appraisal results of appraisal institutions. If the investigation is carried out after the identification results are issued, the process of collecting evidence is cumbersome and requires the cooperation of the owner (or his agent), the wharf and other parties. Unless the situation of false and concealed reports is confirmed on the spot, if a full set of evidence is collected according to the requirements for each unpacking inspection, it will not only occupy more law enforcement resources, resulting in waste, but also may cause confusion to the relevant parties of the owner in the process of collecting information. In practice, the owner (or his agent) even guesses and interferes with law enforcement.

3.3 Analysis of the causes of problems

3.3.1 Reasons for Problems in Target Container Selection Mechanism

(1) It is difficult to carry out comprehensive investigation of all ship-borne containers.

It is difficult to visually observe the actual situation of cargo loaded in a ship-borne container due to its closed nature. In the face of numerous and vague declaration information, it takes a lot of manpower and resources to open the container for inspection of each container, and there are great difficulties in operation, so it is only necessary to open the container for inspection of some key containers. In addition, the supervision resources of maritime administrative agencies are relatively insufficient, and the number of personnel in some grass-roots maritime agencies is small. In addition, there are many coastlines and ports in the jurisdiction. It is even more difficult to conduct a comprehensive investigation of dangerous goods that are falsely reported or concealed.

(2)The reason why the same kind of goods may have different names

The regulatory catalogues implemented by different government departments are not uniform, and the declaration names of the same goods for different government departments are different. The owner of goods shall use the goods names in the Catalogue of Customs Statistics Commodities of the People's Republic of China when declaring at customs, or the goods names in the Catalogue of Outbound Commodities Implemented by Entry-Exit Inspection and Quarantine Institutions when declaring at commodity inspection, while the owner of ships shall use the goods names listed in the International Maritime Dangerous Goods Rules and other international convention rules when declaring dangerous goods at maritime departments.

3.3.2 Reasons for problems in on-site unpacking inspection

(1)Reasons for problems in sampling and inspection

Maritime transportation has its own particularity, which is different from road and railway transportation, laboratories in universities and research institutes, and quality inspection laboratories in production enterprises. The definition of qualified laboratories is strict, and the number of appraisal institutions is small. It is impossible for such institutions to cover all ports. In addition, due to the consideration of operating cost control, appraisal institutions generally require customers to submit their own inspection, but do not provide on-site sampling services. All kinds of reasons restrict the convenience of sampling and inspection. (Chu & Wang, 2015)

(2) Reasons for problems in the inspection site

The wharf yard needs to play two roles, namely, the place for unpacking inspection and the storage of the containers in question. According to the Port Law of the People's Republic of China, the port administrative department at or above the county

level is responsible for the management of port terminals. The unpacking inspection of the maritime department is carried out at the port. Therefore, the supervision of unpacking inspection should involve maritime and port supervision departments, and the boundaries of supervision responsibilities between the two departments cannot be simply divided by ship-shore interface.

As far as the maritime department is concerned, the management of the wharf is lacking. According to the Regulations on the Prevention and Control of Marine Environment Pollution by Ships, the maritime department shall announce the docks and loading and unloading stations capable of carrying dangerous goods. If ships, ports, docks and loading and unloading stations are not equipped with pollution prevention and control equipment, the maritime department shall punish them. However, according to the "Port Law" and other laws and regulations, the management responsibility of the terminal lies with the transportation department. Between different laws and regulations, there are poor responsibilities in the management of docks. Although the penalty is clear, the state has not established a clear standard for anti-pollution equipment in ports and terminals, and there is only one industry recommended standard, namely, Requirements for Emergency Preparedness Ability of Water Pollution Accidents in Ports and Terminals (JTT451-2017). If the maritime department requires the ports and terminals to be equipped with anti-pollution equipment and equipment according to the recommended standard, the ports and terminals will refuse to implement it according to the standards not recommended. If administrative punishment is imposed forcibly, it will easily cause problems such as administrative reconsideration. Even if the maritime department and the port department jointly carry out law enforcement actions and are restricted by law enforcement personnel, the inspection of port terminals by such doors is a periodic and irregular periodic inspection, which cannot ensure that there are comprehensive problems in terminal operation during the operation process.

3.3.3 Reasons for problems in subsequent disposal

(1) Reasons for difficulty in disposal of the containers carrying dangerous goods

First, according to the Regulations on Safety Management of Hazardous Chemicals, there are relevant requirements and supporting systems for the storage of hazardous chemical, and ordinary cargo terminals have no qualifications and conditions for keeping containers carrying such goods. At present, dangerous chemicals that are falsely reported and concealed are still stored in the original ordinary cargo terminal after being caught and before sampling. In case of damage, deterioration, spontaneous combustion, explosion and fire of dangerous goods during seizure due to the lack of storage qualification at the wharf, the interests of the owner or wharf will be damaged, which may lead to litigation risks.

Second, the value of some false reports and concealed dangerous goods is not high, which may be lower than the penalty amount. After being caught by maritime law enforcement officers, it may happen that the shipper or the owner abandons the goods. If dangerous goods in containers are stored in ordinary cargo terminals, the above risks also exist, which may lead to a series of disputes such as storage, transshipment, storage cost and ownership of dangerous goods.

(2) Reasons for problems in investigation and evidence collection.

At present, there is no clear superior law for finding that dangerous goods on board containers are suspected to be false or concealed. The enforcement basis of maritime institutions is mainly the Provisions on Maritime Administrative Punishment and the Discretion Benchmark of Maritime Administrative Punishment. These two regulations only stipulate the applicable punishment and the degree of measures taken, but do not specify how to collect evidence and how to deal with the containers

involved in the on-site investigation. Therefore, the maritime institutions in various ports generally follow the experience to obtain evidence, which is not only irregular or inconsistent, but may even bring risks to law enforcement.

3.3.4 Other internal management problems and their causes

(1)Unpacking inspection personnel lack of professionalism

With the development of industrialization, the throughput and types of dangerous goods in containers on board are gradually increasing, and the requirement of maritime law enforcement personnel is increasingly higher. Maritime unpacking inspection includes the selection of target container, on-site inspection and subsequent disposal, and the required professional background involves navigation, chemistry and law. In addition, in the process of searching IMDG, selecting the target container, unpacking inspection, and English goods information may be exposed, which also requires the foreign language level of law enforcement personnel. Therefore, the maritime unpacking inspection needs a talent team with professional knowledge, but the reserve of current talents is still relatively scarce. In addition, it still needs a long training period for training those with the above professional background. This is mainly due to the complexity of dangerous goods, especially the variety of dangerous goods in the IMDG Code, which makes it impossible to thoroughly understand them, which could only be achieved by accumulating experience in the work, learning while using and summarizing. Therefore, maritime unpacking inspection has higher requirements for law enforcement personnel.

(2)Insufficient logistics support for unpacking inspection

The expenses involved in the container suspected of falsely reporting or concealing include: the cost of unpacking the container at the dock, the cost of storing it in the

storage yard during the detention period, the appraisal fee for sampling and inspection, and the logistics cost, etc. According to the provisions of the Administrative Enforcement Law, the administrative organ shall bear the cost of keeping the goods during the period of seizure. At present, the cost of unpacking inspection for containers suspected of false reporting is borne by the maritime department. The number of unpacking inspections is determined according to the actual situation and there may be temporary situations such as mass reports. Therefore, it is difficult to make an advance budget according to the use process of government departments' funds. If there is a large number of unpacking inspections and the financial pressure on the maritime departments, especially the grass-roots maritime administrations, will be greater.

In addition, the inspection of ships by the maritime department is basically carried out by the basic marine department, and the law enforcement personnel of the marine department have insufficient law enforcement equipment and uneven personal protective equipment to various degrees. If there are dangerous goods falsely reported or concealed, especially toxic, harmful, corrosive and radioactive dangerous goods, the protective equipment of maritime law enforcement personnel and dock personnel may not be sufficient. This will pose a threat to the safety and health of unpacking inspection personnel.

Chapter 4 Solutions to maritime unpacking inspection of ship-borne containers carrying dangerous goods

4.1 Suggestions on selection of target container

4.1.1 Strengthen information analysis and be selective in the target container choosing

Strengthening the collection of basic information and making effective analysis and prediction are important guarantee for the implementation of source supervision.

(1) Screening key industries

Carry out data submission and statistical analysis of dangerous goods transported by water, analyze the laws and characteristics of goods circulation by comparing the data of dangerous goods output and transportation volume, focus on abnormal goods and judge whether there are obvious concealed or false reports of dangerous goods in a region or for a period of time, so as to provide clues for supervision and law enforcement inspection.

Due to the economic development of Fujian Province and its position, it has certain advantages over other ports and the port throughput has increased year by year in recent years. At present, the industrial structure of Fujian Province is dominated by the secondary industry, that is, the industrial development is relatively rapid. There are not only light industries such as shoes, clothing and food, but also heavy industries such as metallurgy and electric power. It is helpful to know the actual situation of port logistics by knowing the products and raw materials of chemical enterprises in surrounding cities. Therefore, according to the present situation of industrial chain in the hinterland of the port, it is suggested to collect the information of important

industrial enterprises through various channels, focusing on the main products, raw materials and other information, and find out the physical and chemical properties of chemical raw materials and finished products generally imported and exported by these industries, so as to provide a reference for the selection of target containers.

(2) Screening of key goods

According to the experience of law enforcement in previous years, in the cargo list provided by shipping companies, the focus is on containers that may be falsely reported and concealed. For example, in recent years, the case of falsely reporting the eighth category corrosive dangerous goods, such as sodium hydroxide and formic acid, as "ceramic frits", have been repeatedly found. So maritime department may focus on the record of loading "ceramic", "frits", "citric acid", "ceramic building materials" and other ship-borne containers with similar names in the shipping list in the future

4.1.2 Establish a database to help select the target container efficiently

(1) Improve the whole logistics chain management and strengthen information sharing

Use scientific and technological innovation means, build an inter-departmental cargo big data platform and strengthen the informatization construction of maritime dangerous goods safety supervision. Establishing an information database of dangerous goods production enterprises, product names, quantity, flow direction, means of transport, employees, etc, is to realize inter-departmental and inter-regional information sharing and exchange, and form a big data platform for goods. The links and chains of production, distribution, storage, transportation, use and disposal of hazardous chemicals are effectively connected, and a scientific intelligent logistics system is introduced to realize the whole logistics chain management of hazardous

chemicals. For the situation that there may be different names of the same goods and different declared names in different government departments, it is suggested that the system add a data comparison module of the possible names of the same goods, which mainly displays the corresponding goods names for different law enforcement departments, and assists in displaying the names of other law enforcement departments. In this way, it can also promote departmental collaboration and law enforcement information sharing at the technical level. (Li, 2020)

At present, some maritime agencies have carried out similar work. For example, Xiamen Maritime Safety Administration developed the "Safety Management Information System for Carrying Dangerous Goods by Container Ships", which realized the functions of "carpet-type" quick investigation of all EDI electronic manifests entering and leaving Xiamen Port and automatic identification of suspected dangerous goods, and it has greatly increased the success rate of investigating and handling false and concealed illegal cases from less than 50% before the operation of the system to 73%, which effectively deterred illegal activities. This is a good reference for establishing the basic database of ship cargo. For example, some maritime departments use the "Safety Management System for Carrying Dangerous Goods by Container Ships" software to import the International Dangerous Code and the list of domestic dangerous goods into the system, and the system will automatically compare them with the information obtained from the port EDI center or the suspicious fields established by the regulatory authorities, thus narrowing the scope of inspection, supplemented by manual judgment, and determining the final target container to be inspected.

(2) Establish a database of applicants, and focus on investigation through integrity management.

From the perspective of top-level design and a nationwide information database of false reporting, concealing illegal acts of dangerous goods in ship-borne containers

should be established and the information database should be networked in national ports for easy inquiry. Announce the illegal behaviors such as "carrying dangerous goods in ordinary goods or concealing dangerous goods or falsely reporting them as ordinary goods for consignment", improve the enterprise credit system and increase disciplinary efforts against untrustworthy units in order to increase their illegal costs. (Sun & Liu, 2019)

To a specific port, the maritime department should focus on collecting the relevant data of container terminal operators, shipping agents, cargo agents, shipping companies, major container logistics companies and chemical production enterprises. In addition, it should master the information of main routes, types of goods transported, shippers, etc. so as to form a database such as container transport business units, blacklists of false reporting business units and blacklists of dangerous goods packaged in the jurisdiction. For freight forwarding enterprises or personnel who illegally represent dangerous goods in waterway transportation by means of concealment or false reporting, the punishment shall be stricter, and if the circumstances are serious, occupational ban shall be imposed and recorded in the personal credit system. For example, Ningbo Maritime Safety Administration listed the ship-borne containers declared for the first time, declared by the declarer for the first time, supervised by the packer for the first time and exported for the first time as the inspection scope, and also used manual judgment to determine the final target container to be inspected. (Chen C. , 2015)

4.1.3 Expand information channels and continue to promote the reward mechanism for reporting

By setting up publicity columns in ports and docks, we will announce the reporting methods and encourage the masses to report false reports and concealed acts. Strictly implement the Measures for Reporting Incentives for Ship Pollution and

Ships Carrying Dangerous Goods, mobilize the masses to participate in information collection, and jointly safeguard the stability of maritime transport in the jurisdiction. It is suggested that the maritime department should set up special funds, and reward those who report false and concealed acts of ship-borne containers after confirmation. In addition, we should strictly keep confidential the informer's information.

4.2 Suggestions for on-site unpacking inspection

4.2.1 Suggestions on innovating unpacking inspection methods

(1) Pilot remote unpacking inspection to solve the problem of insufficient law enforcement personnel in some ports

In view of the problems of long coastline, numerous and scattered ports and insufficient human resources for law enforcement in most grass-roots marine departments, it is suggested to innovate safety supervision methods and make full use of the efficiency of human resources. For example, Pudong Maritime Safety Administration uses "Internet" remote technology and other "non-contact" means to innovate the safety supervision mode of dangerous goods and implement remote unpacking inspection of dangerous goods containers. The law enforcement officers push the data of the pre-inspection system for foreign trade containers on board to check one by one, lock the containers of suspected dangerous goods for unpacking inspection, and then use the Internet tripartite video conference for remote unpacking inspection. In view of the illegal acts found after unpacking inspection, it is also necessary to conduct remote investigation by transmitting the required materials through the Internet. At present, Pudong Maritime Safety Administration has developed the "Visual Security System for the Whole Process of Dangerous Goods in Ship-borne Containers". The system has four technologies, such as face recognition technology, GIS positioning technology, remote video technology and electronic signature technology, which can complete online booking and unpacking inspection

business. (Yang, 2020)

Although the original intention of the above measures is to reduce personnel contact and prevent and control the epidemic situation, it can be referred to as a reference. Because of the unique container number and traceable seal number, remote unpacking inspection is operational. In addition, the implementation of remote unpacking, online booking and online submission of materials not only facilitates the owner and other administrative counterparts, but also helps law enforcement personnel to save the distance between law enforcement stations and docks, which is of reference significance for some stations with long coastline and few personnel. In the actual operation process, the remote details of each link should be carefully considered.

(2) Strengthen law enforcement cooperation and increase the deterrent effect on illegal activities.

The maritime department strengthens law enforcement cooperation with ports, customs and other departments, strengthens the cooperation in the fields of information exchange, mutual recognition of supervision, mutual assistance in law enforcement, etc., jointly investigates and deals with cases of false reporting of dangerous goods containers on board ships, and establishes a joint prevention and control mechanism for dangerous goods to form a joint supervision force. (Huang, 2020)

At present, maritime agencies in most ports in the jurisdiction have signed law enforcement cooperation agreements with customs, border defense and other port departments. If necessary, they can carry out joint actions to improve law enforcement deterrence. However, most of the cooperation agreements involve general contents, including epidemic prevention and control, personnel safety and so on. It is suggested that the level of law enforcement cooperation can be expanded and professional and meticulous cooperation should be carried out to crack down on

false reporting of dangerous goods containers on board. For example, maritime department may strengthen the sharing of cargo information with customs. Considering that the customs can grasp the quantity, specific varieties and cargo information of import and export container cargo. In addition, in terms of information sharing, it is also necessary to strengthen communication with container terminal operation departments and tally units, so as to grasp relevant information in time. For another example, the inspection and quarantine institutions have advanced equipment for detecting varieties of goods, and some new varieties that are difficult to judge whether they are dangerous goods which can be identified with their advanced equipment.

4.2.2 Suggestions on unpacking inspection site

(1)Make rational use of existing customs inspection sites

Most ports have customs inspection sites, which can be fully utilized. In particular, for some ports with fewer containers of dangerous goods on board, the sharing of inspection sites can be considered in the joint law enforcement agreement, and the inspection sites can be fully utilized or appropriately expanded according to local conditions.

(2)Set up a special maritime inspection site

For ports with large throughput of ship-borne containers, it is of practical significance to build a special maritime unpacking inspection site. It is suggested that the maritime department should take the lead and put forward a special marking for the construction of inspection sites in conjunction with relevant departments such as housing and construction. Through the analysis of various risk factors that may occur in the process of unpacking dangerous goods containers, and combining with

the current domestic relevant standards and specifications, the design and operation standards of a maritime unpacking inspection site are proposed to improve the safety and professionalism of unpacking inspection. The construction of such special sites can be carried out step by step. Ports with mature conditions can be selected for pilot projects in advance, and then they can be popularized after the pilot evaluation. (Gao, Li, Wang, & Zeng, 2012)

(3)Establish temporary storage places

The maritime department can take the lead and apply to higher authorities and local governments should set up special funds for temporary management of hazardous goods containers and establish temporary storage places for dangerous goods containers. The containers of suspected dangerous goods found in unpacking inspection shall be immediately transferred to the temporary storage place, so as to avoid being placed in the wharf yard without management qualification for a long time. The site should be equipped with emergency implementation equipment, transport vehicles and professional transport operators.

4.2.3 Suggestions on sampling and testing

(1)Explore the use of rapid detection equipment.

Maritime departments can strengthen the cooperation with local scientific research institutes, carry out relevant research on the supervision of dangerous goods on ships, and rely on the professional technical equipment of scientific research institutes to improve the timeliness and accuracy of identification and reduce the work intensity of supervisors.

(2)Facilitate sampling and inspection in different places

Large-scale testing institutions can develop the sampling and inspection business of dangerous goods on board containers, and set up inspection windows in container ports or ports with large throughput of dangerous goods. The local government should cooperate with maritime law enforcement agencies to open a green channel for inspection in different places, so as to effectively crack down on illegal acts of false reporting and concealment of dangerous goods, ensure safe production in the shipping market, and help the port to carry out supporting services and promote the economic development of the port.

(3)Establish maritime professional qualification certification institution

With the permission of financial personnel, integrate maritime resources and consider establishing a professional qualification certification institution for marine dangerous goods. Screen and audit the existing identification units of dangerous goods and establish a list of identification institutions with firm authority for maritime cargo. Establish strategic cooperative relations with the Chemical Research Institute which accords with the strength of technology and equipment, recognize the professional appraisal report issued by it, jointly maintain the shipping market order of dangerous goods on board, and promote the economic, efficient and safe development of shipping.

4.3 Suggestions on other management mechanisms

4.3.1 Suggestions on internal management of maritime department

(1)Strengthen the construction of law enforcement team

Establish a team of professional law enforcement personnel who can adapt to the current new situation. To open the container for inspection, you must know how to check it. In order to do a good job in the safety management of containers carrying

dangerous goods on ships, maritime managers, especially front-line maritime personnel, should strengthen the study of relevant business knowledge, master relevant international conventions and domestic laws and regulations, and be familiar with the safety management knowledge of packaging, marking, stowage, isolation and fastening of dangerous goods carried by containers. Only by mastering these knowledge can they know well, dare to manage and be good at management. In addition, the maritime department can continuously strengthen the training and updating of law enforcement personnel's business knowledge of danger prevention by means of joint research and academic lectures with the help of teachers from scientific research institutes.

(2)Strengthen the guarantee of funds and law enforcement equipment.

Establish a guarantee mechanism for related expenses of unpacking inspection. Make out-of-container inspection budget, set up special funds for on-site out-of-container inspection of container dangerous goods, and ensure on-site supervision work in an orderly manner. The maritime administrative agency may propose to the higher authorities the introduction of the management rules on the cost of unpacking inspection, and further clarify the attribution of various expenses incurred during the seizure of suspicious dangerous goods. Or consider setting different criteria. For example, if there are false reports of illegal acts, the expenses related to unpacking inspection shall be borne by the violator; otherwise, it shall be borne by the maritime institution.

4.3.2Suggestions on the management of shipping practitioners

(1)Strengthen the supervision of shipping practitioners

Strengthen the management of shipping employees, eliminate the false reporting of

dangerous goods from the source, and reduce accidents caused by false reporting. For one party, strengthen the management of dangerous goods declarers and container packing inspectors, strictly carry out training, examination and certification for the two employees, and even update their knowledge. On the other hand, strict and systematic training should be conducted for the relevant personnel engaged in dangerous goods transportation business (even if they are not directly related), as well as industry supervisors employed by dangerous goods shippers, agents, carriers and other dangerous goods transportation participants, and the training should include theoretical training and practical training to ensure the training effect.

(2)Establish a credit management mechanism

Establish a credit management mechanism with clear rewards and punishments, and encourage shipping companies and their crew members, dangerous goods declaration officers and container packing inspectors to do their own safety management work consciously. The reputation management mechanism includes a "black list" part of punishment nature and a "white list" part of reward nature. The credit mechanism is established on the basic database in the early stage, that is, the credit files established according to the reporting, on-site inspection and mass reporting. (Chen H. , 2007)

The "blacklist" system shall be implemented for dangerous goods ships, declarers and packing inspectors who commit illegal acts. The "blacklisted" ships and personnel are listed as the key inspection objects, and a series of measures such as strengthening the unpacking inspection of containers are taken. This objectively reduces the competitiveness of "blacklisted" ships, and forces enterprises to pay attention to false reporting and concealment. At present, some shipping companies have taken the initiative to take measures to deal with false reports. For example, COSCO Shipping Container Lines charges a penalty of US$ 10,000 per natural container for concealing or falsely declaring dangerous goods by shippers, and recovers all losses and expenses suffered. (China COSCO Shipping, 2017)

Implement a "white list" system for safe and honest dangerous goods ships, dangerous goods declaration officers and container packing inspectors, and realize preferential management policies. The "white list" ships can open up a green channel under specified conditions and can be exempted from on-site inspection within a certain period of time. Thereby objectively accelerating the turnover efficiency of the "white list" ship and improving the competitiveness of the shipping company where the ship is located. This can also encourage shipping companies to take the initiative to enhance safety management awareness.

Chapter 5 Conclusion and Prospect

5.1 Conclusion

Fujian Province is one of the major marine provinces in China, and the Fujian sea area is the most important main channel in China's north-south shipping. As maritime economic activities are becoming increasingly busy and maritime cargo transportation is on the rise, which put forward higher requirements for the safety supervision of Fujian maritime departments. The safety of shipping dangerous goods container transportation is not only directly related to the economic benefits of shipping companies, but also related to the environment safety of ships, crew, ports and their surrounding waters. In this dissertation, starting from the current situation of supervision of ship-borne containers by the maritime department (taking Fujian Maritime Safety Administration as an example), the problems existing in each link such as the selection of target containers, unpacking inspection, subsequent disposal and internal management are analyzed, and the corresponding supervision solutions are put forward on the basis of research status.

5.1.1Solutions to selection of target container

(1) Establish a large database, including the establishment of a cargo database and a credit database.

(2) When conducting spot checks, we should focus on analyzing the development of local industries and pay attention to key goods, routes and ships.

(3) We should actively broaden information access channels and reward illegal reporting.

5.1.2 Solutions to on-site unpacking inspection

(1) In terms of unpacking methods, it is suggested to explore new unpacking modes, such as remote unpacking on a pilot basis.

(2) In terms of unpacking site, the existing customs inspection site should be reasonably utilized or a special maritime inspection site should be set up in combination with the actual situation of the port. Establish temporary storage places for illegal containers.

(3)On sampling and inspection, on the one hand, it is suggested to explore the use of rapid testing equipment. On the other hand, create conditions for convenient testing, including facilitating sampling and inspection in different places and establishing maritime professional institutions for certificating qualifications.

5.1.3 Solutions to other management mechanisms

(1) In the internal management of the maritime department, strengthen the construction of law enforcement team and guarantee of special funds.

(2) In the management of shipping practitioners, it is suggested to strengthen the supervision of employees and establish a credit management mechanism.

5.2 Prospect

Since the links involved in ship-borne dangerous goods containers are complex and my knowledge and work experience are limited, this dissertation still has shortcomings in the following aspects, which will be studied in depth in the future work:

First, the proposal of the target container selection mechanism relies too much on the basic database and software. This will bring huge basic workload and challenge the construction and maintenance of software and hardware.

Second, considering that the studied port is located in the jurisdiction of Fujian Maritime Safety Administration, domestic reference and case examples are the main ones, and foreign experiences are seldom used for reference.

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