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WORLD MARITIME UNIVERSITY

Shanghai, China



**Port Safety—Comparison of Port Safety Management System in Europe, the
United States and China**

BY

XIN ZHUANG

China

A research paper submitted to the World Maritime University in partial fulfillments of
the requirements for the award the degree of

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Port Safety—Comparison of Port Safety Management System in Europe, the United States and China

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Abstract With the increasing seaborne trade volume, port is playing a more and more important role. As a critical aspect of all operations performed in port area, safety should be taken more seriously. Good safety performance should be supported by good safety management system practices. In this dissertation, we analyzed the way European and the United States ports organized their safety management system and apply these advanced methods in our safety management mechanism according to our situation.

Keywords Port safety, Port management system, Legal framework

1. INTRODUCTION

With the increasing seaborne trade volume, maritime safety is playing a more and more important role in the economic and social development of China. China has a vital national interest in maritime safety, which substantially depends on the safety of ports.

Many of maritime-related operations take place in ports, covering vast area of quays and involving a large number of companies and people. As a critical aspect of all operations performed in port area, safety should be taken more seriously. Any failure in port operation system or human error may cause serious, even fatal accidents. Successful management of port safety means the protection of marine environment, port structure, port facilities and human life.

1.1. Background and purpose

There was a severe safety accident taken place in port area last year. The huge fire and explosions happened at a chemical storage building in port of TIANJIN, which raise the public concern of port safety again. Since we cannot be completely prepared for these woeful occasions, we have to formulate detailed safety plans and exercise these plans in realistic situations through an effective port safety management system.

Now, China is getting through the reformation of port management system by decentralizing the central government control and separating government administration from enterprise management, which has a great impact on port safety management.

We have interviewed some departments and companies involving port safety management. There is a common issue they mentioned, the scope of responsibility is not so clear among these administration and supervision departments. They often do the same thing with different standards when they enforce the regulations and conventions of port safety. They work inefficiently and bring troubles to companies. They hope to have well-defined responsibilities. They want to know what they should do within port management system clearly. It is necessary for us to seek a more efficient port safety management system and define the duties clearly in the regulations.

1.2. Research Methodology

In this dissertation, I will review literature about port safety in Europe and the United States to analyze how European country and the United States organize their port safety management system and legal framework under the system. I will compare port

safety management system in China with Europe and the United States. After comparison, I will find the problem in China. Then, I will apply these advanced methods from Europe and the United States in our safety management system according to our situation.

2. LITERITURE REVIEW

The literature of this issue had been divided in three parts in this review. The first part is about the International regulations and conventions, which are published by IMO's Maritime Safety Committee or some other organizations. The literature presented a review of maritime safety regimes and provided some recommendations on how to improve the system.

The second part is about the prevention for the force majeure such as flood, fire, etc. In this part, the literature focused on the technical improvements against the force majeure to achieve the production safety.

The third part is about human, which get noticed by most experts. The literature proved the importance of human in safety management and provided some solutions like safety education and safety supervision to help manage people.

“ It is obvious that the human is the center of safety in general.”¹Grancharova Valentina and Grancharov Ivaylo, Safe access and operation with port area, *Journal of marine technology and environment*, “ We can reduce injuries and accident by focusing on managing safety behavior, safety training programs and co-workers' safety behavior.”²

There are many researches analyzing the important elements of port safety, they did not pay much attention to how to organize the management of port safety and the

¹ G Valentina, G Ivaylo, (2013). Safe Access and Operations Within Port Area. *Journal of Marine Technology & Environment*, 1

² Ibis

legal framework under the safety management system in single country. And they rarely mentioned port safety management system in China. In this dissertation, I will present and analyze the problems in Chinese port safety management system through the comparison with some European country and the United States.

3. PORT SAFETY MANAGEMENT SYSTEM IN EUROPE AND THE UNITED STATES

3.1. Port safety management system of European Union

3.1.1. Patterns

European Union established European Conference of Minister of Transport to deal transportation affairs exclusively. ECMT is responsible for the development of European waterway and classification of ship type. It is also responsible for drafting the unified laws and regulations like Pilotage Law, Law of Carriage of Goods, Law of Cargo Handling in Terminal, Law of Import and Export in port, which are applicable to all member countries. It helps to coordinate the nation laws and regulations of member countries in a higher position.

“They also promote the implementation of Europe Canal Project to member countries, which make the waterway layout in Europe more reasonable by connecting the Rhine, the Seine, the Rhone and the Danube together as an inland waterway network.”³

³Lu Changli, (2006). Experience of joint development between Port of Hamburg and the Rhine. *Shipping Management*, 5, Vol.28

Besides, ECMT is responsible for drafting the unified laws and regulations like Pilotage Law, Law of Carriage of Goods, Law of Cargo Handling in Terminal, Law of Import and Export in port, applicable to all member countries, which coordinate the relevant laws and regulations of individual country.

As the crucial decision-making and enforcement agencies, European Commission and European Council also play an important role in the development and implementation of EU shipping policies and laws.

The responsibilities of European Commission are to develop and implement shipping policies and laws. From the aspect of legislation, the formulation of EU laws mainly comes from the proposed action of European Commission. Otherwise, European Council has no authority to develop policies and laws alone. From the aspect of enforcement of law, the enforcement of policies and laws need the supervision and implementation from European Commission. Besides, European Commission can also accept the authorization or entrustment of European Council, responsible for the decision-making of policies and laws. In addition, to improve the efficiency of work, “Euro Commission compartmentalized the work responsibilities and assigned them to general administrations, subsidiaries of European Commission, in charge of specialized sectors.”⁴ The Seventh General Administration is responsible for the formulation and implementation of shipping policies and regulations.

As the most important decision-making body of EU, European Council is directly involved in the legislation of shipping. They only have the right to vote on legislative proposals from European Commission. The right of proposal is still hold by European Commission.

3.1.2. Legal framework

To enhance the safety management of port and shipping, European Union carried out

⁴ Chi Tuo, (2010). “ The Enlightenment of EU Inland Shipping Safety Law to China”, in Dalian Maritime University.

a series of laws and policies.

The most representative laws and policies are:

“ European action outline for inland waterway development, Ship registration institution of European Community, Vessel inspection regulations of the Rhine, 1101/89 regulation, Law of waterway, Law of cargo handling in terminal, Law of carriage of goods, The Rhine regulations, Law of ship, Law of dangerous goods, Law of pilot, Law of import and export in port, Seveso II Directive, Mannheim Convention, SOLAS74 Convention, MARPOL73/78 Convention, STCW78/95 Convention, STCW Standard, ISM Regulation, The Rhine navigation regulation and so on.”⁵

The laws and regulations can be classified and concluded as:

(1) Laws and policies on ship safety

In the respect of ship technical standards, the requirements are mainly from EU laws, Manheim Convention and the guidance of United Nations Economic Commission for Europe. The Manheim Convention introduced the principle of freedom of navigation, premised on the compliance with convention and the maintenance of safety.

In 2006, European Parliament and European Council came up with the Directive 2006/87/EC and abolished 1982/714EEC. The directive aims to promote the development of inland waterway transport in Europe by improving the standard of ship technical standards. It has established a high level of safety standards in line with the technical standards of ships in the Rhine basin. The implementation of these rules is a great improvement for the safety of inland waterway transport in Europe.

In the aspect of ship registration and ship age regulation, EU set up the European Community ship registration system (known as EUORS), which is parallel with the

⁵ Zhang Le, (2013). “ Research on the Legal System o Inland Waterway Shipping”, in Harbin Engineering University.

ship registration regulation in member states. EUORS ship has two kinds of identity of member state and EUORS. The main purpose of the plan is to attract ships back to Europe to register and promote the employment of European sailors. But, since the finance ministers from member states thought there was a conflict between the interest of member states and the interests of European Union in the preferential tax policy, this system has not been well implemented by the majority of member states. However, the rules from EUORS, age of the vessel shall not be more than 20 years, make EUORS registered ships more safer than other ships.

In the aspect of ship safety measures, European Parliament and European Council developed the directive 2005/44/EC in September 7, 2005. The purpose of this directive is to enhance the competitiveness and attractiveness of inland waterway transport through the progress of inland waterway information services technology. The widely application and constantly updating of these information and data improve the efficiency and safety in ship transportation.

In the aspect of dangerous goods, EU promulgated Seveso II Directive and NAIADES to regulate the carriage of dangerous goods. Under these regulations, there are 13 countries in the European Union building a ship accident database and focusing on the application of modern technology in dangerous goods transport and staff training.

(2) Laws and policies on crew safety management

In the aspect of crew safety management, European Commission has announced Directive No. 48 in December 1989 for the recognition of senior officer and Directive No. 51 in June 1992 for minimum seaman training standards. They also came up with Directive No. 58 in 1994 to establish the link between crew employment and navigation safety. And the newest instruction for minimum seaman training standards is Directive 2001/25/EC.

(3) Laws and policies on shipping companies' safety management

Directive 87/540/EEC of the European Council provides rules for the admittance to the domestic and international waterway cargo carriers. This directive has a series of strict rules and regulations for ship technical requirements, crew qualification and safety production system construction to strengthen the safety supervision.

(4) Laws and policies on port safety management

European Commission promulgated Directive 2005/65 in October 2005 to improve port safety in Europe. The objective of this directive is to introduce a high-level security system to all ports in Europe. This directive completes the regulation for ship and port security system, proposed by European Commission in May 2003, and provides protection to the entire maritime transport logistics, as the framework for regulations of port and port facilities safety.

3.1.3. Feature analysis

European Union is the economic and political community of Europe. The power of EU laws comes from the alienation of sovereignty of member countries. The EU laws are also instructive for the member country. The legislative procedure of law of port safety management is mature and standardized. European Commission and European Council perform their own functions, as the most important decision-making body of EU. And the laws and regulations of port safety management, promulgated by the EU, are clearly classified. They have laws and regulations for every segment in port safety management. The legal system is complete.

Besides, the European Conference of Ministers of Transport also contributes to the coordination of port safety management in member states. ECMT helps to draft the unified laws and regulations applicable to all the member states, which bring convenience to the member states when they deal with the port safety issues. If the member states have a consensus on the application of EU law, they don't need to waste time to decide which law to apply when they solve the problems between the

member states.

EU set the port safety management system, as a model for the member states. It provides the possible solution for disputes between member states. It helps to coordinate the port safety management work in member states.

3.2. Port safety management system in Germany

Germany is the major country in Europe with important ports and waterways. Port safety management in Germany is representative.

3.2.1. Patterns

Germany is a federal country. The setting of German port management agencies includes federal and state management departments. Ports are regarded as social infrastructure, which belong to the federal government. The federal government doesn't manage the port directly. Instead, the state government implements the port management on behalf of the country.

In federal management system, there are three vertical-level agencies. Germany government set up the Ministry of transportation construction and urban development, referred to as the Federal Ministry of Transportation, to manage shipping issue. Under the Federal Ministry of Transportation, there are 7 waterway administrations. The 7 waterway administrations consist of 39 shipping bureaus. There are 15000 employees in total under the federal management system authorized by the Federal Republic of Germany Waterway Act, managing the entire waterway safety, planning, instruction and other matters.

The main responsibilities of the Federal Ministry of Transportation in shipping management:

“(1) to develop national transport plans; (2) to be responsible for the construction and maintenance of federal waterway and ports; (3) to formulate policies, laws and regulations, like ship safety and technical standards or specifications, inland shipping transportation plan.”⁶

As the highest level of federal shipping management system, the basic function of the Federal Ministry of Transportation is decision-making.

The waterway administrations are set up for the management of different shipping areas. The main duties of each waterway administration are as follows:

“(1) to be responsible for the maintenance of shipping infrastructure in the shipping area; (2) to manage the shipping order in the shipping area; (3) to be responsible for the canal toll management in the shipping area; (4) to be responsible for the new construction project management; (5) to supervise the implementation of national policy and manage the permission of using the channel; (6) to manage the technical inspection of ship, crew examination and certification.”⁷

As the middle level of federal shipping management system, the basic function of waterway administrations is management.

Shipping bureau is the most basic part. The main responsibilities of shipping bureaus are:

“(1) to monitor and manage the shipping order; (2) to set and manage the fairway buoys; (3) to implement the construction plans; (4) to collect the shipping information; (5) to supervise the schedule of new construction project.”⁸

As the most basic part of federal shipping management system, the basic function of shipping bureaus is implementation.

⁶Waterway Act for Federal Republic of Germany. Chapter 1.(1990)

⁷Ibid.

⁸Ibid.

In state management system, shipping administration in each state manage port and shipping independently. The state formulated safety management laws, standards and norms, such as the shipping regulation and the terminal management regulation in their own area. They are responsible for the construction of waterway and maintenance of shipping order.

We can take port of Hamburg as an example. In 1970, the state shipping administration established the port authority of Hamburg to perform the administrative function of port, which controlled by the state company HHLA before. Port authority, the governmental institution, took over the responsibility of management, supervision and construction. They separated administration function from the port enterprise. They implement the real management of a port.

The responsibilities of the federal government and the state administration of shipping management are strictly defined by the law, which forms a clear and consistent management system.

3.2.2. Legal framework

Germany has a complete system of laws and regulations on the safety management of shipping and ports in three levels.

The first level is the laws, regulations and technical standards published by the European Commission, river commissions and Germany government. The laws and regulations published by the European Commission: the law of waterway, the law of cargo handling in terminal, the law of carriage of goods, and ANDR (A regulation of dangerous goods transportation, including waterway transport, land transport and railway transport). The laws and regulations developed by river commissions: inland river shipping law, the law of inland waterway transport of dangerous goods. German government also successfully connected the domestic law with the legal system of EU laws. The law of inland waterway transport of dangerous goods is the good practice of

Germany government.

The second level is mainly composed of the two rules released by the Federal Ministry of Transportation. One is applicable to the international water area of the Mosel River and the Rhine. Another is applicable to the international water area of the inland waters except these two rivers.

The third level is the rules and regulations in the technical aspects, such as ship type selection, transportation regulation and so on, which are formulated by the waterway administrations under the Federal Ministry of Transportation. The complete system of laws and regulations makes port safety management in Germany clear and efficient.

3.2.3. Feature analysis

As a federal country, port safety management system reflected the federal features. The port safety management responsibilities of federal government and state government are strictly defined according to the law. The federal government is mainly responsible for the promulgation of the related laws and regulations. They supervise the implementation of these laws and regulations. They stand in a higher position to execute the integration of inter-state waterway and shipping, connect them with the port area. And the state government actually performs the administrative function of port. They formulated local safety management standards and norms on the basis of nation law. They set up institutions like port authority to take over the responsibility of management, supervision and construction. The scope of responsibility is very clear.

Except the coordinated relationship between federal and state government, the structured vertical management system is remarkable. Federal management system consists of three levels, the Federal Ministry of Transportation, waterway administration and shipping bureaus. They all have their own job to do. The scope of responsibility is clear. The management system is very consistent and effective.

The legal framework of port safety management is also structured. There are three levels: (1) regulations and technical standards published by the European Commission, river commissions and Germany government; (2) rules released by the Federal Ministry of Transportation; (3) technical regulations formulated by the waterway administrations under the Federal Ministry of Transportation. Regulations from higher level are aimed to coordinate the regulations from lower level.

The landlord mode of port of Hamburg brings referential experience to other countries. The establishment of port authority of Hamburg separated the administrative function from the state company HHLA. The port authority is responsible for leasing, construction and management of the port. They don't get involved in the profit-making activities. It provides a relatively free environment of competition for the port enterprises. Besides, the application of information technology also contributes to port safety management in German. "The largest port in German - Hamburg Port began to invest in building EDI system in 1983, the world's largest data information network, which can achieve data switching between the world's major ports." ⁹ The widely use of EDI system in port safety management helped Hamburg Port maintain its status of the second largest port in Europe for such a long time.

3.3. Port safety management system in Netherlands

3.3.1. Patterns

The shipping and port safety in Netherland is mainly managed by the Ministry of Transportation and Water. The Ministry of Transportation and Water is responsible to ensure that the infrastructure is suitable for inland waterway transportation, to manage the transportation safety and to create good conditions for inland waterway transportation.

⁹ Pan Konggu (1992), "A case study of port safety supervision mechanism of dangerous goods", in *Ningbo University*.

The Ministry of Transport and Water consists of the directorate-general of public works and water management, the directorate-general of freight transport, directorate-general of passenger transport, the directorate-general of civil aviation, the directorate-general of communication and telecommunication, the directorate-general of strategy coordination and Royal Dutch meteorological research institution. In port safety management, the directorate-general of freight transport has the biggest impact.

The directorate-general of freight transport is a functional department of the Ministry of Transportation and water, which is responsible for the establishment of a safe, competitive and stable cargo transport system. Its main tasks can be concluded as: (1) to formulate and adjust the policies; (2) to draft and implement the relevant legislation; (3) to promote the reformation; (4) to manage the planning and implementation of relevant infrastructure construction policy; (5) to monitor the implementation of relevant projects; (6) to promote the development of transportation industry in the Netherlands.

There are several departments in the directorate-general of freight transport, policy research, transportation, transportation safety, traffic monitoring, shipping monitoring, market organization and navigation. According to its internal mechanism, the directorate-general of freight transport has three characteristics: first, is to treat the freight system as a whole; second, is to promote the fair competition between the transport companies; third, is to ensure the safety of transport. The targets of the directorate-general of freight transport are: to establish a transport market under free competition; to achieve the coordination of international and domestic legislation; to maintain the safety in transport.

Especially in the aspect of safety management, the directorate-general of freight transport formulated many safety policies, including transport safety, environment impact, transport of dangerous goods and the employment of equipment, infrastructure and personnel. The directorate-general of freight transport is also responsible for the implementation of relevant laws and regulations of safety

management. It performs the functions of inspection, supervision and punishment according to law, mainly related to the legal driving time and rest time, and the monitoring of dangerous goods transportation. It has the right to detain or to force the ship to stop when performing duties, these powers are derived from the provisions of the state laws, such as the inland waterway cargo and passenger transport act, the law of dangerous goods transportation and so on.“ Besides, the market organization department under the directorate-general of freight transport is responsible for the management of transport safety and competitive environment in the field of transport.”

¹⁰Within the scope of the inland waterway freight transport and passenger transport law and the north-south transport cargo distribution law, the department issued the certificate of registration of the Rhine barge certificate, license, professional transport license and private transportation. The market organization department also issued a permit to vessels outside of the European Union, called third country transport, and supervision of the European Community Council on the implementation of the structural improvement of inland waterway regulation 1101/89 regulations. The department also registered for the exemption of 55 meters of the following motor vessels and deal with the application for exemption from the time of navigation and the crew (inland waterway) act.

Most ports in Netherland take the landlord mode in the port management. The port of Rotterdam is good example. The infrastructure in port area belongs to the municipal government of Rotterdam. Port authority of Rotterdam is responsible for administration, construction, leasing and supervision of the port. They are not on a commercial basis. Port enterprises lease the infrastructure in port area and develop their own business.

3.3.2. Legal framework

The law of Holland is mainly composed of two parts, the European Union law and the

¹⁰Zang Yanyou, (2008). Comparison of maritime management in China and aboard. *China Water Transport*, 8(2): 155-156.

domestic law of Netherland, and the effect of the EU law is higher than that of the domestic law of Netherland. As we know, the EU law applies to where the law of the European Union has been specified. And Rotterdam is the estuary of the Rhine and the Maas River, which made Netherland have an important position in the European inland waterway transportation. Therefore, the Convention of Mannheim also applies to Netherland.

To manage the transportation of dangerous goods, Netherland formulated the law of dangerous goods transportation. The law emphasized the investigation of implementation, enforcement and penalties. At the same time, the law also provides relevant department should strengthen the inspection of dangerous goods vessels. For example, the general ships should have an inspection every 10 years. And for ships carrying dangerous goods, they need to have an inspection every 5 years. In addition, Netherland also came up with the scrapping subsidy policy to speed up the upgrading of the ship.

3.3.3. Feature analysis

Port safety management in Netherland is mainly controlled by the directorate-general of freight transport under the Ministry of Transport and Water, and the local port authority. The directorate-general is responsible for the promulgation of laws and regulations related to port safety. It promotes the integration of port and waterway construction in the whole country. Compared with the management structure in Germany, the directorate-general has many horizontal and functional departments, like policy research, transportation, transportation safety, traffic monitoring, shipping monitoring, market organization and navigation. It is very helpful to specialize in different segments in shipping.

The local port authority takes in charge of the actual administration of local port. Port administration and port operation are separated. For example, port authority of Rotterdam is responsible for administration. Port enterprises lease the infrastructure in

port area and develop their own business. Besides, port of Rotterdam, the largest port in Europe, developed the application of EDI technology in 1985. The use of unmanned automated systems made it to be the port with the highest efficiency in Europe. The emergency center control room of Rotterdam port is equipped with a reserve of 6 kinds of dangerous goods information database. The central control room can transfer out the relevant information and achieve a variety of real-time data information exchange. At the same time, the central database is also connected with the fire department, the implementation of dynamic, full, automated supervision.

The hierarchy of port safety laws and regulations in Netherland is very clear. The legal system consists of the European Union law and the domestic law of Netherland. The effect of the EU law is higher than that of the domestic law of Netherland. The laws and regulations are well classified to meet the requirement from different segments of shipping. They also focus on legislation of hazardous goods.

From the experience of Germany and Netherland, we can see that European countries have a complete system of laws and regulations on the safety management of shipping and ports in every aspect of safety management. They defined the duties of agencies in safety management system very clearly. They also apply the advanced information technology system in their work.

3.4. Port safety management system in the United States

3.4.1. Patterns

The United States is a federal country. The government does not directly manage the port. According to the principle of territoriality, the state government or municipal government set two-level management institutions, the port management committee and the port authority, to manage ports. It is the typical landlord port management mode.

The administration of the United States ports is divided into two levels, that is, the federal government level and local government level. We have to know that land is privatized in the United States. But the land resources along the coastal line belong to the federal government. The state government is authorized by the federal government to develop the port. The federal government of the United States does not directly manage the port. The port is actually managed by the local state government according to the territorial principle. In spite of this, the federal government of the United States of America still has some management institutions for port construction and assume the safety related functions. The maritime administration of the federal ministry of transport, the coast guard and transport security department are responsible for the port security. And the port operation safety is under the control of occupation health safety department and the coast guard. The formulation of relevant regulations is the duty for the coast guard, army corps of engineers, the ministry of transport security and the maritime administration in the federal ministry of transport.

The federal ministry of transport, the army corps of engineers and the coast guard are the three important institutions of port safety management system in federal level.

First, the federal ministry of transport in the United States was founded in April 1, 1967. Its main function is to ensure the efficiency, safety and convenience of the transportation system. The maritime administration (MARAD) is a subordinate agency of the federal ministry of transport, which was set up in 1981 according to Maritime Act in 1981. Its responsibility is to drive the development of the shipping system to meet the requirements of the development of national economy and national security. They aim to maintain the advanced status of the American merchant fleet to meet the requirement of inland waterway transportation, international maritime transportation and the military transportation during the war. They try to keep the effective shipbuilding and ship repairing capacity, port capacity, multimodal transport system and shipping reserve capacity, to meet the needs in national emergency.

Second, the army corps of engineers founded in 1824 has been authorized by the

Flood Control Act 1938 to organize the planning, construction and management of flood control, shipping, power generation, environmental protection, water supply, water entertainment and some other activities. When the army corps of engineers develops the annual plan or five-year plan of waterway management plan, they must report to the Congress and accept the inspection from the Congress.

Third, the coast guard is a military and multi-task force, one of the five major U.S. armed forces, which is funded by the government budget expenditure. They are always ready to defend the country's safety, environment and economics in times of peace and war. They have five core responsibilities: maritime safety, maritime traffic management, maritime security, national anti defense and protection of natural resources. Maritime safety responsibilities include search and rescue, maritime security, safety of yachts and international ice patrol. Maritime traffic management duties include helping navigation facilities management, icebreaking services, vessel traffic management and bridge management. Maritime security duties include maritime drug, the fight against illegal immigration, protection of the exclusive economic zone and the marine life resources, maritime law enforcement. National defense responsibilities include homeland security, ports and waterways safety and breaking the ice in sovereign area. Natural resources protection duties include environmental protection and emergency response, protection against waste pollution, examination of vessels with foreign nationality examination and the protection of marine life resources.

The United States also set up the two-level management institutions, port management committee and the port authority, in the state or municipal government. The port management committee is the highest decision-making body of the port. Its main responsibility is periodic review of the port development and management policy. The port authority is the government authorized port management mechanism with the nature of the enterprise. Its main responsibilities are port planning, construction, public port facilities maintenance, port security, handling quality and environmental

protection etc. The port authority is also responsible for signing the lease contract with the terminal handling company and collect rent and related fees. The port authority is self-supporting. They do not need to pay taxes to the government nor profit. The profit is for all parts of the construction and development of ports.

Besides, the Congress of the United States also plays an important role in port safety management. They provide the support of legislation. The shipping related departments in the Congress are the transportation and infrastructure committee of the House of Representatives, the commerce, science and transportation committee of the Senate, the appropriations committee of the Senate, the environment and engineering council of the Senate. “Especially, the commerce, science and transportation committee of the Senate is responsible for the inland waterway, merchant marine and navigation issues except construction.”¹¹ There are 7 sub committees under the commerce, science and transportation committees of the Senate. The surface transportation and merchant marine sub committee is one of the seven. The affairs under the control of surface transportation and merchant marine sub committee include: National Railroad Passenger national Corporation, AMTRAK, Surface Transportation Board, Federal Railroad Administration, Federal Maritime Commission, Saint Lawrence Seaway Development Corporation, railway industry, motor carrier industry, maritime administration, pipelines, transportation safety, merchant marine and hazardous materials Transportation.

Except legislation and law enforcement supervision from the government, the United States also got the help from many industry associations. They get involved in the formulation and implement the relevant policies, laws and regulations. They make efforts to communicate and coordinate with companies. They provide useful information and intelligence to companies. Virtually, industry associations have also become an important part of the management system.

¹¹Zang Yanyou, (2008). Comparison of maritime management in China and aboard. *China Water Transport*, 8(2): 155-156.

The United States government regards the supervision of port safety as the primary mission in port management. Through the continuous reformation, they gradually established a relatively complete disaster relief system. This integrated relief system includes:

“(1) a set of disaster management laws and regulations and emergency plans; (2) a joint emergency organization system governments consists of functional departments, industrial and commercial enterprises, the news media and social organizations, volunteer organizations at all levels; (3) the application of high technology in disaster monitoring and early warning system; (4) The four-stage actions including prevention, preparation, response and recovery; (5)The disaster management mobilization system.”¹²

3.4.2. Legal framework

In the field of shipping legislation, Shipping Act and Merchant Act consist the main body of U.S. shipping legal system. They introduced the development direction of U.S. shipping and some basic rules of shipping safety and port management. And the federal government published the decree to implement the policies, laws and regulations formulated by the Congress.

In the field of maritime traffic legislation, the ports and waterways safety law and the inland water navigation rules are the important legislative basis for the management of water traffic order. The 1972 ports and waterways safety law is a specifically regulated law for maritime safety and crisis management. The ports and waterways safety law required the United States coast guard to make the construction rules for tankers and other vessels carrying pollution materials in American waters. And the 1994 ports and waterways safety law authorized the U.S. ministry of transportation and the coast guard to formulate relevant rules to protect maritime safety. In maritime security legislation fields, the 2002 maritime transportation security act is the

¹²U.S. Department of Transportation. (1997). Port Security: A National Planning Guide. Washington D.C.

supplement to the 2001 port and maritime security law, which extended the maritime anti-terrorism functions of relevant department and awarded the coast guard new anti-terrorism functions. In 2002, the Maritime Transportation Security Act modified the ports and waterways safety law, increased the relevant provisions of the American ports and waterways safety, expand the scope of application and coast guard's jurisdiction.

The United States has the most complete legislation for port safety. Especially, after 9.11, the United States improved the level of port safety unprecedentedly. In December 2001, the United States introduced the 2001 port and maritime security law. Half a year later, they introduced the 2002 maritime transport anti-terrorism law. These two laws constitute the core and foundation of the United States port safety system. In October 2006, the United States introduced an independent law, the Safe Port Act. It tight a series of port safety related laws and standards together and implemented the new port safety standards in the United States. With the advocacy and promotion of the United States, international port safety management system has been developed rapidly. The International society started the legislation of maritime anti-terrorism. The International Maritime Organization passed the amendment to the international convention for safety of life at sea, SOLAS 1974, in unprecedented speed. They also developed the international ship and port facility security code, ISPS code. These two rules both contribute to the formulation of new international port safety system.

3.4.3. Feature analysis

The United States is the major federal country. Port safety management system definitely reflected the federal features. The port safety management responsibilities of federal government and state government are clear defined. The land resource along the American costal line belongs to the federal government. But the federal government doesn't directly manage the port issues. They authorize the state government to manage the port. It doesn't mean the federal government did nothing

with the port safety. The federal government still has functions of legislation, supervision and planning.

The management system of port safety is well structured. They have the federal ministry of transport, the army corps of engineers and the coast guard in federal level to support the safety management work of port. They have port management committee and port authority in state level to implement the actual management of port safety.

The landlord port mode is very typical in the United States. We can take port of New York and New Jersey as an example. The port administration and port operation are separated. Port authority in port of New York and New Jersey is responsible for administration. The infrastructures in port area are leased by port enterprises to develop their own business. This port management mode brings the prosperity of port of New York and New Jersey.

The United States has a complete legislation for port safety. The laws and regulations are detailed and well classified. After 9.11, they improved the level of port safety unprecedentedly. They enhanced the legislation of port safety, especially in anti-terrorism aspect. They also established an integrated disaster relief system to prove port safety management.

Besides, the industry associations also played an important role in the formulation and implement the relevant policies, laws and regulations. They communicate and coordinate with companies. They also provide useful information and intelligence to companies. The great efforts from government and society lead to the successful management of port safety.

4. PORT SAFETY MANAGEMENT SYSTEM IN CHINA AND COMPARISON

4.1. Patterns

Chinese government set up the Ministry of Transport to manage shipping issue. Since the right of port administration is transferring to local port, the administrative department of local port also plays an important role in port safety management.

Under the jurisdiction of the Ministry of Transport, we have multiple levels of management agencies related to port safety management: (1) China Maritime Safety Administration: directly subordinate maritime safety administration and provincial maritime safety administration. (2) River system administration, like Changjiang river administration of navigational affairs and Zhujiang river administration of navigational affairs.

The Ministry of Transport is responsible for the safety management of the port in the whole country, and the main responsibilities are:

“(1) to carry out the relevant laws and regulations of the state, and formulate rules for the safety management of national ports; (2) to organize the formulation of technical standards and specifications for the safety of the port; (3) to establish a national emergency response system of the port and develop emergency plans for emergencies; (4) to establish a national information system for port safety and emergency; (5) to guide and coordinate the port safety and emergency management work among the provincial administration of transport.”¹³

As the law enforcement agency of the Ministry of Transport, China Maritime safety Administration is responsible for the execution of laws and regulations promulgated by the Ministry of Transport and central government. It needs to coordinate the port and shipping safety management work among maritime safety administration at all levels.

¹³Port Law of the People's Republic of China. Chapter 1. Art. 6 (2004)

Directly subordinate maritime safety administration is responsible for the port safety management within the administrative area. The main responsibilities are:

“(1) to implement the relevant laws and regulations of the state, the technical standards and norms of the Ministry of Transport concerning port safety. And they formulate specific administrative measures by combining the real situations; (2) to manage the port safety according to the law; (3) to report the information of port safety to the Ministry of Transport on a regular basis; (4) to guide and supervise the work of port safety management in the local port administration department; (5) to develop the port emergency plan and the emergency response system with the administrative area.”¹⁴

Provincial maritime administration takes in charge of the safety administration and supervision work in its precinct, which is deputed by China Maritime Administration. It is responsible to the provincial administration of transport.

River system administration is responsible for the safety management of port in the river system. For example, the main responsibilities of Changjiang river administration of navigational affairs are: (1) To organize the draft of the shipping related rules and regulations in the Yangtze River valley, to set the strategy for development of the Yangtze River shipping and supervise the implementation of the strategy; (2) to be responsible for the administration of the Yangtze River shipping, the macro-control of shipping market and the supervision of the Yangtze River waterway construction market; (3) to organize the transportation of national key materials and emergency supplies, to assist in the transportation of military supplies in the Yangtze River valley; (4) to be responsible for the supervision of the quality of passenger and freight transport, shipping infrastructure projects and waterway constructions in the Yangtze River valley; (5) to manage the water safety and shipping public security work in the Yangtze River valley, according to the provisions; (6) to coordinate the relevant work of shipping administration of 13 provinces and cities in

¹⁴Port Law of the People's Republic of China. Chapter 1. Art. 7 (2004)

the Yangtze River valley.

The administrative department of local port is responsible for the supervision and administration of the safe production of the port. The main responsibilities can be concluded as: (1) to implement the relevant laws, regulations, rules of the state, regulations of the Ministry of Transport and the technical standards for port safety; (2) to be responsible for the management, supervision and inspection of the safety production of the port; (3) to supervise the implementation of the safe production responsibility system for port enterprises; (4) to be responsible for the supervision and administration of the construction project for port safety; (5) to be responsible for the supervision and administration of the dangerous source and dangerous area in the port; (6) to organize the promotion, education, training and assessment of port safety; (7) to formulate the emergency plan for emergency, to organize the establishment of emergency rescue team equipped with emergency relief supplies, to establish and improve the emergency response system; (8) to issue reports and complaints in accordance with the law and investigate violations of the provisions.

Besides, China is getting through the reformation of separating government administration from enterprise management. Port enterprises also get involved in port safety management. Port enterprises are the subject of liability for the port production safety. The main responsibilities can be concluded as: (1) to establish and improve the responsibility system for production safety; (2) to establish the safe management agency and allocate the safety management personnel; (3) to develop the rules and regulations and operating procedures for port production safety; (4) to ensure that managers and employees receive appropriate safety education and training; (5) to equip the equipment and facilities to meet the conditions of production safety; (6) to formulate and implement its own emergency response plan; (7) to report the occurrence of the production safety accidents and other emergencies timely and truthfully.

4.2. Legal framework

The legal system of port safety management in China can be divided into two parts, the international conventions and the domestic laws and regulations. The international conventions are SOLAS and ISPS code. And the domestic laws and regulations are mainly drafted by the National People's Congress of the People's Republic of China, the State Council of the People's Republic of China and the Ministry of Transport.

The laws promulgated by the National People's Congress of People's Republic of China can be concluded as:

Table 1: port safety laws from the National People's Congress of People's Republic of China¹⁵

Name	Publishing Institution	Date
Law of the People's Republic of China on Work Safety	The National People's Congress of People's Republic of China	Date of Promulgation: 2002-06-29 Date of Implementation: 2002-11-01 Current Version: 2014-08-31
Port Law of the People's Republic of China	The National People's Congress of People's Republic of China	Date of Promulgation: 2003-06-08 Date of Implementation: 2004-01-01 Current Version: 2015-04-24
Maritime Traffic Safety Law of the People's Republic of China	The National People's Congress of People's Republic of China	Date of Promulgation : 1983-09-02 Date of Implementation : 1984-01-01

The regulations promulgated by the State Council of the People's Republic of China can be concluded as:

¹⁵Table 1: port safety laws from the National People's Congress of People's Republic of China, sorted by myself.

Table 2: regulations from the State Council of the People’s Republic of China¹⁶

Name	Publishing Institution	Date
Regulations on the Control over Safety of Dangerous Chemicals (Decree No.344/No.591 of the State Council of the People’s Republic of China)	The State Council of the People’s Republic of China	Date of Promulgation: 2002-01-26 Current Version: 2011-02-16
Regulations of the People’s Republic of China on Administration of Traffic Safety in Inland Waters	The State Council of the People’s Republic of China	Date of Promulgation: 2002-06-28 Current Version: 2011-01-08
Regulations on the Administration of Domestic Water Transport (Decree No.625 of the State Council of the People’s Republic of China)	The State Council of the People’s Republic of China	Date of Promulgation : 2012-10-13 Date of Implementation : 2013-01-01

The regulations promulgated by the Ministry of Transport can be concluded as:

Table 3: regulations from the Ministry of Transport¹⁷

Name	Publishing Institution	Date
1. Provisions on the Safety Management of Water Transport in the Solid Bulk Cargo	The Ministry of Transport	Date of Promulgation: 2011-11-09
2. Provisions on the People’s Republic of China on Safety Supervision and Administration of Hazardous Goods	The Ministry of Transport	Date of Promulgation: 2003-11-30 Date of Amendment: 2014-03-14
3. Provisions on the People’s Republic of China on the Safety Management of Water Activity and Navigation	The Ministry of Transport	Date of Promulgation: 2011-01-27
4. Measures on the Evaluation and Administration of Port Safety	The Ministry of Transport	Date of Promulgation: 2004-08-20
5. Provisions on the Administration of Port Security	The Ministry of Transport	Date of Promulgation: 1989-03-04

¹⁶Table 2: regulations from the State Council of the People’s Republic of China, sorted by myself.

¹⁷Table 3: regulations from the Ministry of Transport, sorted by myself.

6. Provisions on the Safety Management of Hazardous Goods at Ports	The Ministry of Transport	Date of Promulgation: 2012-12-11 Date of Implementation: 2013-02-01
7. Rules on the Safety Management of Tanker	The Ministry of Transport	Date of Promulgation: 1983-04-12
8. Provisions on the Safety Supervision and Administration of Marine Ro-Ro Ship	The Ministry of Transport	Date of Promulgation: 2002-05-30
9. Provisions on the Safety Management of Inland River Ferry Crossing and Ferryboats	The Ministry of Transport	Date of Promulgation: 2014-06-18 Date of Implementation: 2014-08-01
10. Rules on the Minimum Safety Manning of Ship in the People's Republic of China	The Ministry of Transport	Date of Promulgation: 2014-06-30 Date of Amendment: 2014-08-22
11. Interim Rules for the Safe Navigation of Non-motorized vessels of the People's Republic of China	The Ministry of Transport	Date of Promulgation: 1958-08-16

Besides, the river system administration of transport, the provincial administration of transport and the administrative department of local port also promulgated a series of regulations and rules.

For example, Shanghai Maritime Safety Administration published Measures on the Safety Supervision and Management of Pilotage, to implement the laws of central government. These subsidiary government institutions formulate their own rules and measures to execute the instructions of central government more effectively.

4.3. Feature Analysis

In China, Port safety management can be divided in two parts: administration of the Ministry of Transport and its subordinate departments, administration of local port.

The structure of subordinate departments under the Ministry of Transport is very

complicated. China Maritime Safety Administration can be regarded as a functional department in the Ministry of Transport. Under the China Maritime Safety Administration, there are 14 directly subordinate maritime safety administrations. And there are 32 provincial maritime safety administrations under the control of provincial administration of transport. It takes in charge of safety management work deputed by China Maritime Safety Administration.

The central government is trying to transfer more right of administration to local port. But, actually, the Ministry of Transport and its subordinate departments still mainly control port safety management.

With the reformation of separating government administration from enterprise management, port administrative department can focus on the management work. Port administrative department can supervise the production safety in port enterprises more effectively.

The legal framework of port safety is hierarchical. Departments at lower level always promulgate rules and regulations corresponding the rules and regulations promulgated by departments at higher level. The National People's Congress of the People's Republic of China and the State Council of the People's Republic of China are playing a leading role in port safety legislation. And the classification of laws and regulations for different segments is relatively clearly.

4.4. Comparison of port safety management system in Europe, the United States and China

4.4.1. Comparison of port safety management pattern

Germany and the United states are federal country. The infrastructure of port area belongs to federal government. Federal government doesn't manage port issue

directly. According to the principle of territoriality, federal government authorizes state government to manage the port. It doesn't mean the federal government did nothing with the port safety. The federal government still has functions of legislation, supervision and planning. In China, central government starts to transfer the right of administration to local government. But, the relationship between central government and local government in Germany, the United States and China is quite different. The state government (local government) in Germany and the United States is more independent. They have right to make their own laws and regulations for the state. In China, local government is under the leadership of high-level government. Local government doesn't have much autonomy.

In port safety management pattern of Germany and the United States, there are federal level management and state level management. The settings of management institutions are a little bit different in these two countries.

First, in federal level, Germany government set the Federal Ministry of Transport to deal with shipping related issue, like port safety. There are several major rivers flowing through Germany, like the Rhine. For the geographical reason, the government also set waterway administrations and shipping bureaus under the Federal Ministry of Transport to coordinate the ports and shipping management work along the river. In the United States, the federal government set Federal Ministry of Transport to manage port and shipping issue. In addition, the army corps of engineer and the coast guard also helps to manage port safety issue. They focus on the emergency solution and national threats like terrorism.

Second, in state level, Germany has state shipping administrations. The state shipping administration set port authority to manage the port, like port authority of Hamburg. And the administration and business operation are separated in German port. Port authority is only responsible for the administration. In the United States, state governments have port management committee, which is the highest decision-making body of port in the state. Under the leadership of port management committee, port

authority manages the port issue. Administration and business operation in American port are also separated. Landlord mode in Germany and the United States is typical. And we have to realize administration of state level in Germany and the United States is totally different from China. The definition of state government is different. State control in Germany and the United States is more independent. The port administration of state is not subordinate institution of federal government.

In China, the Ministry of Transport is responsible for port and shipping management in the State Council of the People's Republic of China (central government). And in the Ministry of Transport, China Maritime Safety Administration is mainly responsible for the ports safety management. In different administrative area, China Maritime Safety Administration has its subordinate institution. These subordinate maritime safety administrations are not independent. They can't make important decision by themselves. They have to follow the leadership of the Ministry of Transport and China Maritime safety administration. To coordinate the management work along the main rivers in China, the Ministry of Transport set the river system administration. The purpose is similar with waterway administration under Federal Ministry of Transport in Germany. But, comparing with the waterway administration, the river system administration in China is more powerful. The port administration along the river in China must accept the directive of river system administration. In Germany, as the state control is more independent, waterway administration can't order the state port administration directly. They can only help them to coordinate the work between states.

Beside, central government in China started to transfer more right of administration to local government. They set local port administration to manage the port issue. And the government also promoted the reformation of separating government administration from enterprise management. We can see some characters of landlord mode in this reformation.

However, in Netherland, the situation is different. Netherland, the kingdom of

Netherlands, is a constitutional Monarchy. The land resource is privatized in Netherland. The infrastructure in port area belongs to municipal government. The municipal government set port authority to develop port. Landlord mode of port is also applicable in Netherland. The national government set the Ministry of Transport and Water to management port and shipping management. There are many functional directorate-general under the Ministry of Transport. The directorate-general is responsible for the promulgation of laws and regulations related to port safety. It promotes the integration of port and waterway constriction in the whole country. Compared with China, Germany and the United States, the directorate-general in Netherland has many horizontal and functional departments, like policy research, transportation, transportation safety, traffic monitoring, shipping monitoring, market organization and navigation. It is very helpful to specialize in different segments in shipping.

Besides, in the United States the industry associations also played an important role in the formulation and implement the relevant policies, laws and regulations. They communicate and coordinate with companies. They also provide useful information and intelligence to companies. The great efforts from government and society lead to the successful management of port safety.

We can conclude that the similarities in port safety management patterns between Europe, the United States and China are: (1) Germany, the United States and China are big countries with lots of states. So, how to manage the relationship between central government and local government are really important in these three countries. (2) In the Federal management level of Germany, the setting of waterway administrations and shipping bureaus is similar with river system administration and subordinate maritime safety administrations. We can take them as the extension of central government management. (3) China has separated the government administration from enterprise management in port. From the separation of port administration and port enterprises, we can see the landlord character in China ports,

similar with Germany, Netherland and the United States.

We can conclude that the differences are: (1) Germany and the United States are federal countries. The relationship between central government (federal government) and local government (state government) are different. The state government in Germany and the United States are relatively independent. They can even promulgate their own laws. But in China, the local governments are under the control of central government. They are not independent. The state port administration in Germany and the United States are under the control of state government. The provincial administrations in China are more like the subsidiary of central government. (2) The United States paid more attention to the safety (or security). In the federal level, they have two law-enforcement teams with military nature. Besides, in the United States the industry associations also played an important role in the formulation and implement the relevant policies, laws and regulations. (3) The character of port authority (administration) in Germany, Netherland, the United States and China are different. Port authorities in Germany, Netherland and the United States are with the nature of enterprise. But in China, port administration is a functional department of government. (4) Because of the polity, port safety management system in Netherland is quite different and we mentioned before.

4.4.2. Comparison of legal framework of port safety

These countries all have two levels of laws and regulations for port safety management: international conventions and domestic law. In European country they also have EU laws to follow.

The relationship between laws promulgated by the central government and laws promulgated by the local government is different. In the United States and Germany, states have right to promulgate the state law independently. The law from higher level is aimed to coordinate the laws of different states. It is like a unified standard to solve the dispute between states. But in China, the regulations from lower administration

level are made strictly corresponding the laws and regulations from higher administration level. The purpose of regulations from lower administration is to better interpret and implement the laws and regulations of higher administration level.

Each country has its emphasis in the legal framework of port safety management. In Germany, they pay attention to the structure of laws. There are three levels: (1) regulations and technical standards published by the European Commission, river commissions and Germany government; (2) rules released by the Federal Ministry of Transportation; (3) technical regulations formulated by the waterway administrations under the Federal Ministry of Transportation. In Netherland, they focus on the legislation of hazardous goods. They have clearly classified laws for various kinds of hazardous goods. They even have database for hazardous goods. In the United States, they have the most complete legislation for port safety. Especially, after 9.11, the United States improved the level of port safety unprecedentedly. They take safety as the primary work in port management, especially for the cargo safety and defense of terrorism. With the advocacy and promotion of the United States, international port safety management system has been developed rapidly. For China, the well classification of hazardous goods law in Netherland and the emphasis of safety in United States are necessary for us to learn.

5. SUGGESTIONS

5.1. Analysis of current problems of port safety management in China

5.1.1. Problems in port safety management pattern

The reformation of port management system brings problems to the safety management of the port.

Since 2002, the right of administration of port has been transfer to the administrative department in local port. The administrative department of local port took over the safety management function, which belongs to the Ministry of Transport and its subordinations before. Port Law of the People's Republic of China, implemented in January 1, 2004, assigned the responsibilities of port management to the administrative department of local port. And safety management is a really important segment for the port administration department when they perform the function of the port management.

In the process of transition, the institutional setting and staffing of port administration department are still inadequate. The port administrative department did not supervise and inspect port enterprises well. They did not define what to manage clearly. They did not have effective solutions to deal with existing problems. The responsibilities of the port administrative department and other relevant department are not defined clearly. The local safety supervision department, the port administrative department, port enterprises, maritime department and fire department all have duties to supervise and manage the port operation safety. Affairs involving port safety have to be checked by so many departments. And all the departments are doing the same thing.

The huge fire and explosions in port of Tianjin raised the public concern of safety management of hazardous cargo in port area. We can take supervision of hazardous cargo in Tianjin as an example. After the reformation, the work of hazardous cargo supervision should be taken by the port administration of Tianjin. Actually, Tianjin Maritime administration still gets involved in the safety management of hazardous cargo in port area. As the particularity of hazardous cargo, the local safety supervision department, fire department and police department in Tianjin all have duty to inspect on the hazardous cargo safety in port area. When accidents happen, we can't make sure that who is actually accountable for the supervision of hazardous cargo safety in

port area. The overlap of law-enforcement seriously counteracts the effect of port safety management. It disturbed the order of port production and bring heavy burden to port enterprises.

In port safety management, the organization of talented safety management staff is also important. The quality of the staff determines the quality and effect of safety management. The lack of safety management personnel or the appointment of uninformed staff will cause serious consequences.

Unfortunately, the lack of safety management personnel is common in ports of China. We can take port of Ningbo as an example. According to the report,

“ There are 75 personnel responsible for the supervision of hazardous cargo safety in port of Ningbo. The average age of them is 45. About 75% of them have bachelor degree. Only 3 of them have the background of hazardous cargo management.”¹⁸

Most personnel are lack of professional knowledge. The defective port safety management team directly restricted the effect of port safety management.

5.1.2. Problems in legal framework of port safety

The laws and regulations on safety management are the basis for the port administrative departments to exercise safety management responsibilities. In last few years, the work concerning the port safety management legislation is fruitful. The government carried out the Law on Work Safety, Port Law and Maritime Traffic Safety Law. The Ministry of Transport also made a great contribution to the development of port safety legal system. They promulgated Provisions on the Safety Management of Water Transport in the Solid Bulk Cargo, Provisions on the People's

¹⁸ Pan Konggu (1992), “A case study of port safety supervision mechanism of dangerous goods”, in *Ningbo University*.

Republic of China on Safety Supervision and Administration of Carriage of Hazardous Goods, Measures on the Evaluation and Administration of Port Safety, Rules on the Minimum Safety Manning of Ship in the People's Republic of China and some other regulations. The government formulated a relatively normative legal system of port safety management.

But, the legal system is lack of the unified operation standard for all types of cargo, especially oil, bulk liquid chemicals and liquefied petroleum gas. The current laws and regulations for hazardous goods cannot meet the requirement of safety management in the increasing port enterprises operating hazardous goods transportation.

For example, the explosion of liquefied hydrocarbon tank at the storage building of Shandong Shtar Science & Technology Petrochemical Co., Ltd. on July 16, 2016 raised the concern of Rizhao port authority. They didn't have the detailed and clear regulations and rule for the inspection of liquefied hydrocarbon tank in port area before. They are willing to implement some inspection of this type of cargo to reduce the risk. Actually, The absence of regulations for various hazardous goods is very common in China.

Besides, the administrative department of local port and the port enterprises did not formulated the suitable rules for themselves to implement the laws and regulations of the Ministry of Transport, the National People's Congress and the State Council. The absence of laws and regulations raise the risk of safety incidents.

5.2. Suggestions

5.2.1. Suggestions for port safety management pattern

First of all, we need to clarify the responsibilities of relevant administrative

departments. In the port safety management system of European country and the United States, the administrative departments have strictly defined duties. For Chinese government, we should avoid assign the same work to administrative departments at the corresponding level. The scope of management should be well defined between different administrative departments. For example, the safety assessment of port construction is the duty only for port administrative department. The safety supervision department of local government doesn't need to get involved in this issue.

We should persist the reformation of separating government administration from enterprise management, which is regarded as the practice of landlord port. Landlord port mode is common in the United States and some European countries. In this mode, the port administrative department (port authority in western country), is responsible for planning of ports, formulation of laws and regulations, lease of port terminal, construction and maintenance of port infrastructure, management of port safety, supervision of ship dynamics, supervision of loading and unloading quality, protection of environment and some other work. They have great management autonomy and land use rights. Making profit is not their purpose. They don't participate in the market competition of port. They implement the management function through the planning and construction of port. And the port enterprises usually lease the terminals and lands from port administration department for business purpose. After leasing the terminals and corresponding lands, the port enterprises can construct the necessary facilities and production equipment, such as lifting equipment, warehouses, office buildings, etc.. If the lease expired, the port enterprises have to return to the land and all of the property to the port administration department.

For example, the reformation of port of Shanghai is the successful practice. Shanghai transport and port administration and Shanghai International Port (Group) Co., Ltd were established in 2003. As the functional department of Shanghai city government, Shanghai transport and port administration is responsible for the overall planning and

development of the port of Shanghai, the port services and the implementation of the unified management of water transport. Shanghai International Port (Group) Co.,Ltd takes terminal operation and containers as the main business. They attract diversified investment. They contribute to the integration of port resource and the development of port market. (Shanghai transport and port administration has been subsumed into Shanghai Municipal Transportation Commission)

According to experience in Shanghai and some other port cities, we can conclude that:

(1) The reformation satisfied the interests both of the government and the enterprise. The government has eased the financial burden and reduced the concerns. The government can concentrate on the overall planning of the port, the implementation of the port regulations, and ensure the safety of the port operations.

(2) After the implementation of the reformation, the purpose of port enterprise is making profit. The enterprise got rid of the political and bureaucratic constraints and formed a relatively free of the business environment. The fast response to customer demand and the thoughtful service bring more opportunities to the port enterprise.

(3) They establish long-term fixed investment and financing channels of the port infrastructure construction and management. The government diversified the huge investment risk to the project related users, engineering companies and other investors.

(4) The reformation not only can meet the needs of the development of port enterprises, but also maximize the utilization of land. Port investors will try their best to improve the utilization rate of limited lands for the better development and higher profits.

(5) All the resources associated with the port can also be integrated by grafting capital, mergers and acquisitions and other ways. It can to reduce the overlap of investment

and achieve the full use of port capacity.

(6) After the reformation, port not only can provide the fast transport and reliable transfer of goods, but also form a complex services network along the logistic chain. It brings the possibility of the competition between shipping companies and terminal operation companies.

(7) The privatization and internationalization of ports will bring convenience to the import and export operation. It will attract more important strategic partners for port development, such as some large international logistics companies, shipping companies, shippers, and terminal operation companies.

However, there are still some ports haven't implement the reformation of separating government administration from enterprise management. The government has to push the reformation in major ports of China more effectively.

5.2.2. Suggestions for legal framework of port safety

Besides, the legal system of port safety management should be completed. As we mentioned, the legal system in European port safety management is well classified. They have laws and regulations for every single segment of shipping and port operation. To meet the raising requirements of safety management in diversified operations in shipping and port area, our government have to speed up the relevant legislation. We need the legal system with the unified operation standard for all types of cargo, especially oil, bulk liquid chemicals and liquefied petroleum gas. We also need to make the definition of duty scope of each department more clearly to support the port safety management pattern.

Except the suggestion for the definition of port administrative department and the completeness of legal system for port safety, we also have some suggestions for the implementation of port safety management:

(1) To establish the education and training system. We need professionals equipped with the knowledge of safety management and safety technic to perform the safety management responsibility. Port safety management team building should follow the relevant laws, regulations and requirements. To form a qualified and professional safe management team, all the safety management personnel should have strict training of port safety management knowledge and safe technology knowledge. And the port administrative department should check the safety training record on a regular basis.

(2) To establish the systematic and standardized safety inspection system. The port enterprises should formulate the internal production safety inspection system according to the actual situation of their own. They should analyze the object of examination and list the unsafe factors at all levels before the safety inspection. Then, they find out shortcomings according the listed factors.

(3) To establish the safety qualification assessment system of port enterprise. The level of the port enterprise's safety management is uneven. To change the current status, the port administrative department needs to have strict assessment on the technical conditions, the infrastructure, the level of safety management and the professional qualification. For the technical personnel in the port enterprise, they also need to be examined in safety knowledge, skill and consciousness.

(4) To improve the emergency response system. We should enhance the assessment and monitoring on the accident-prone areas, environmental sensitive areas, dangerous places and private hazardous goods terminals. We need to establish the early warning system in these risky areas. The periodic training and exercise will help us to response quickly and efficiently in the real emergencies.

The improvement of management system in port safety is the essential target of port safety management. A perfect port safety management system will provide safe and efficient environment for the production of port, and protection for the production safety of the port.

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