Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2013, 5(11):357-361

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Research on risk identification of dangerous chemicals in shipping logistics

Tang Liang, Shen Ju-qin, Liu Bo and XU Zi-lin

Department of Accounting, School of Business, Hohai University, Nanjing, P. R. China

---

ABSTRACT

The risks existing in shipping Logistics of dangerous chemicals are identified employing teardown analysis from the perspective of the producers. The risks are divided into two categories: intra-system risks and inter-system risks with detailed analysis to establish a risk list for shipping dangerous chemicals.

Keywords: dangerous chemicals; risk identification; shipping logistics

---

INTRODUCTION

The demand for various dangerous chemicals as necessities for production and daily life keeps a growing momentum along with the continuous social and economic development. Shipping is most preferable for transportation of dangerous chemicals [1]. However, the special properties of dangerous chemicals and the innate risk of shipping constitute great threat to security and the environment. It is thus necessary to conduct risk management on shipping logistics of dangerous chemicals to ensure its safe and smooth operation. In the management, top priority is given to identifying existing risks in shipping dangerous chemicals. Then those information can be used as a reference for corresponding risk management.

1 Selecting methods for risks identification

Risk identification is the top priority for risk management and it is also the key factor for its success. Certain methods are necessary to be adopted to conduct the risk identification because the shipping of dangerous chemicals is a demanding and risky task [2]. It can be affected by multiple factors. So that effective operation of the risk management is ensured.

Methods commonly used for risk identification entails teardown analysis, flowchart, check-list and expert surveys. All of them have their own characteristics and scope of application.

From the perspective of producers of dangerous chemicals, the transportation of those articles is more hazardous and more technical with multiply affecting factors and lower flexibility compared with logistics of common commodities. That is why producers of dangerous chemicals are confronted with many uncertainties in the process [3]. Moreover, the dangerous chemical industry sees fast development along with the constant economic development in recent years. Therefore, the demand for logistics is increasing. Shipping enjoys low cost among various modes of logistics and thus develops with a high speed. In the same waters, the number of vessels keeps growing as progresses in shipping logistics, which is also under pressure. The natural environment, climate conditions, geological and hydrological conditions are undertaking some changes and there are more uncertainties in the aquatic environment. Therefore, the uncertainties confronting the shipping logistics keep enlarging with growing trend of potential losses. A thorough and profound analysis needed to establish the risk system and ensure safe and smooth operation of shipping dangerous chemical.

Teardown analysis is a method for risk identification with strong adaptability and wide scope of application [4]. The

basic rational of the method is to break down a complicated system into simple and recognizable subsystems for the purpose of risk identification. In this teardown process, different methods and various perspectives can be employed at the same time. Based on the above analysis, teardown analysis is suitable to be used in conducting risk management of shipping logistics of dangerous chemicals.

2 Risk identification of shipping logistics of dangerous chemicals based on teardown analysis

The following procedures are recommended to be followed in the risk identification process:

First, from the perspective of producers of dangerous chemicals, the shipping of dangerous chemicals is regarded as a whole and the risks in the shipping are divided into intra-system and inter-system risks. The former refers to the uncertainties resulting from the special properties of dangerous chemicals, producers of dangerous chemicals and stakeholders of shipping logistics. And the later refers to uncertainties affecting the shipping led by changes of outer environment besides those factors mentioned above [5].

Second, based on the division of intra-system and inter-system risks, it is necessary to analyze and explore the two sorts of risks. The purpose is to ensure the regular and orderly operation of the shipping activity. The two kinds of risks need to be further decomposed respectively according to the characteristics and procedures of shipping logistics of dangerous chemicals to seek specific uncertainties [6]. If necessary, further decomposition is possible to find out a risk system more comprehensive and responsive.

Finally, the risks identified are integrated and summed up systematically to form a risk list for shipping logistics of dangerous chemicals.

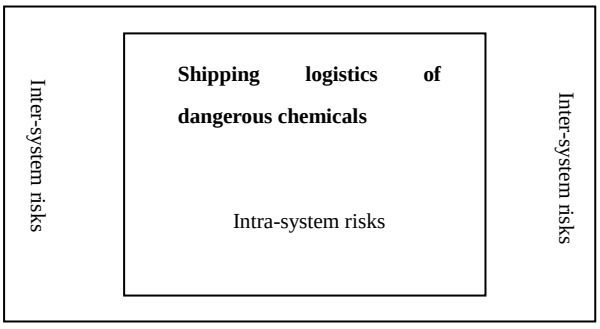
According to the above analysis, the identification is recommended to be conducted as follows.

2.1 Decomposition of the risk system of shipping logistics of dangerous chemicals

From the perspective of the producers of dangerous chemicals, the value of their products can only be realized through market circulation, which must depend on logistics. Logistics represents a systematic work concerning many procedures with multiply affecting factors. Therefore, it is necessary for producers of dangerous chemicals to make preparations well to avoid emergencies.

Dangerous chemical is a special kind of product and its logistics is affected by more factors compared with logistics of common commodities. And once an accident occurs, risks are much greater. The producers are required to analyze the potential risks according to the special properties of dangerous chemicals and the requirements on logistics. Notwithstanding more factors affecting the shipping process of dangerous chemicals, two categories are summed up as intra-system and inter-system risks [7]. The former refers to the uncertainties resulting from the special properties of dangerous chemicals, producers of dangerous chemicals and stakeholders of shipping logistics. And the later refers to uncertainties affecting the shipping led by changes of outer environment besides those factors mentioned above.

The result of decomposition is illustrated in Graph 1.



Graph 1 Decomposition of the risk system of shipping dangerous chemicals

As illustrated in Graph 1, the risks confronted by producers are divided into two categories: intra-system and inter-system. The division contributes to identify the risks in the process of shipping logistics of dangerous chemicals. The research also analyzes and explores the two sorts of risks to establish a more comprehensive risk system.

2.2 Further identification of risks in shipping logistics of dangerous chemicals

Further identification of the intra-system and inter-system risks is necessary to establish a comprehensive system for risk identification, and offer reference to ensure effective risk management.

2.2.1 Intra-system risk analysis of shipping logistics of dangerous chemicals

Intra-system risks refer to the uncertainties resulting from the special properties of dangerous chemicals, producers of dangerous chemicals and stakeholders of shipping logistics. From the perspective of producers, the intra-system risks confronted during the shipping process are mainly the three aspects mentioned above.

The special properties are the ignitibility, explosiveness, toxic and easy diffusion of dangerous chemicals, leading to uncertainties in the process of shipping. Specifically, the main risks lie in ignitibility, explosiveness and easy diffusion.

Risks from the producers of dangerous chemicals are those uncertainties arising in storage, transportation and loading because of mismanagement by producers themselves. Specifically, those risks mainly entail: logistics security management system, allocation of managerial personnel, security control of storage, security control of loading, emergency plan and equipment.

Risks from stakeholders of shipping dangerous chemicals refer to those uncertainties affecting the whole process of shipping including storage, transportation and loading caused by participators of the shipping activity (mainly logistics enterprises) besides producers of dangerous chemicals. The management risks of producers mainly include security management organization, security management system, transportation management system, equipment, vessels, quality of human resources, and emergency plan of logistics enterprises.

Based on the above analysis, the intra-system risk system of shipping logistics of dangerous chemicals is shown in Table 1.

Table 1 Identification of intra-system risks in shipping logistics of dangerous chemicals

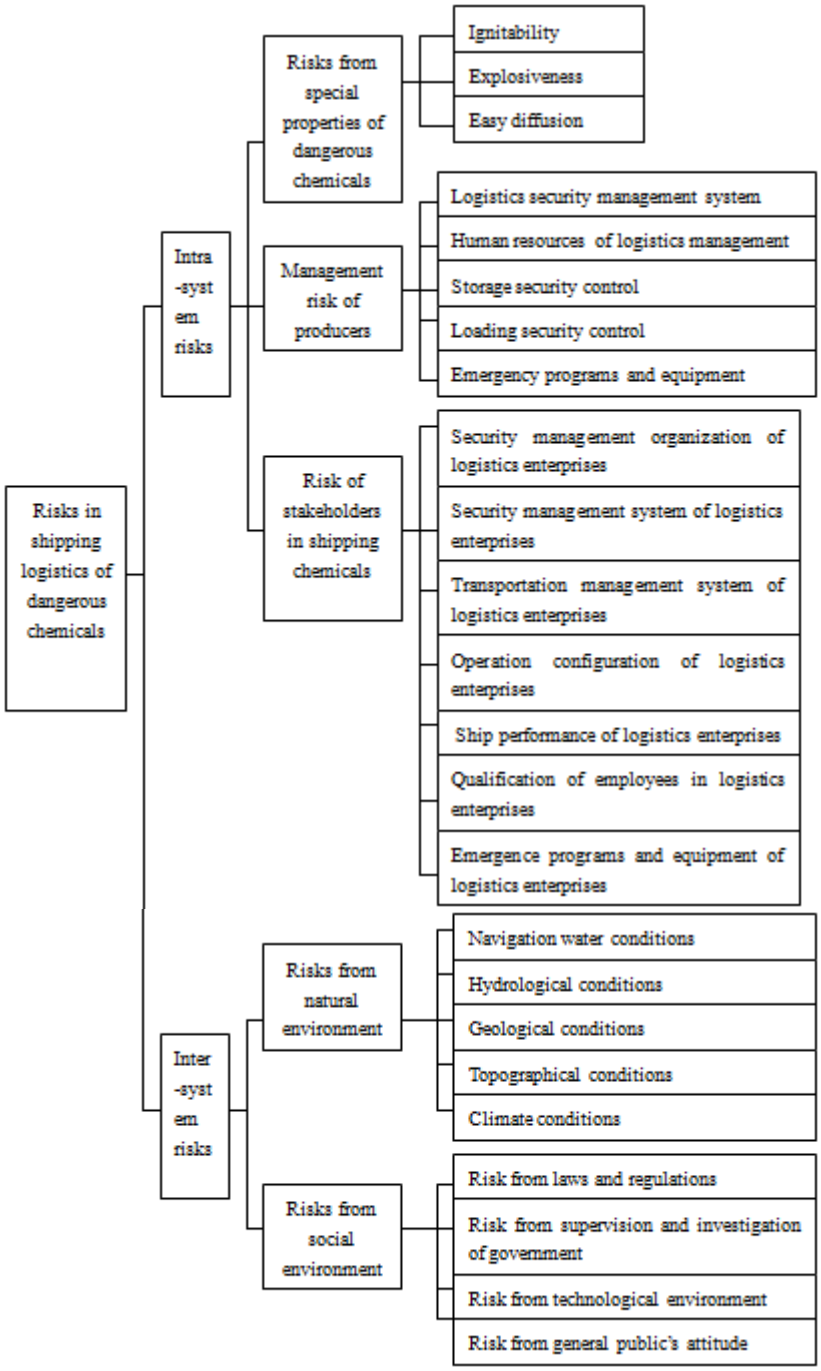
	Risks	Representation
Intra-system risks in shipping logistics of dangerous chemicals	Risks from special properties of dangerous chemicals	Ignitibility
		Explosiveness
		Easy diffusion
	Risks from producers of dangerous chemicals	Logistics security management system
		human resources of logistics management
		Storage security control
		Loading security control
		Emergency programs and equipment
	Risks from stakeholders of shipping dangerous chemicals	Security management organization of logistics enterprises
		Security management system of logistics enterprises
		Transportation management system of logistics enterprises
		Operation configuration of logistics enterprises
		Ship performance of logistics enterprises
		Qualification of employees in logistics enterprises
		Emergence programs and equipment of logistics enterprises

2.2.2 Analysis on inter-system risks of shipping logistics of dangerous chemicals

Inter-system risks refer to uncertainties affecting the shipping led by changes of outer environment besides those factors mentioned in the previous section.

It is believed that the risks confronting producers of dangerous chemicals in shipping are mainly from two sources: natural environment and social environment.

First of all, shipping is different from traditional modes of logistics on land. Shipping must be in waters and thus waters and hydrological conditions would exert certain influences to it. Besides, shipping logistics of dangerous chemicals are also affected by geographical, topological and climate factors. It is proposed in the paper that the risks resulted from natural environment are mainly five aspects including navigating waters conditions, hydrological conditions, geological conditions, topographical conditions and climate conditions.



Graph 3 Risk list for shipping logistics of dangerous chemicals

Secondly, because shipping of dangerous chemicals itself is of certain risk and social influence, it is necessary for the government to enhance its work on supervision, investigation and management on shipping security. It is also necessary for them to lead the activity through formulating laws and regulations. Moreover, shipping of dangerous chemicals is not ordinary logistics and it needs technological support. And it must be affected by the overall technological level of the society. And once accidents in terms of security occur, the whole society would also be affected. The attitudes of the public thus also need to be taken into account in shipping logistics of dangerous chemicals. It is proposed in the paper that the risks resulting from social environment mainly include risks of laws and regulation, supervision and investigation of government, technological environment and attitudes of the public.

Based on the above analysis, the inter-system risks of shipping logistics of dangerous chemicals are shown in Table 2.

Table 2 Identification of intra-system risks

	Risks	Presentation
Inter-system risks	Risks of natural environment	Risk from navigation waters
		Risk from hydrological conditions
		Risk from geological conditions
		Risk from topographical conditions
		Risk from climate conditions
	Risks of social environment	Risk from laws and regulations
		Risk from supervision and investigation of government
		Risk from technological environment
		Risk from general public's attitude

2.3 Identification results

A list including the risks of shipping logistics of dangerous chemicals is formed on the basis of analyzing the intra-system and inter-system risks through teardown analysis. The list is shown in Graph 3.

CONCLUSION

According to the basic procedures of teardown analysis, the risks of shipping logistics of dangerous chemicals are divided into intra-system and inter-system risks. Then further identification targeting the two kinds of risks is conducted. It is believed that intra-system risks entails risks of special properties of dangerous chemicals, management risks of produces of dangerous chemicals and risks from stakeholders in shipping of dangerous chemicals. And inter-system risks include risks of natural environment and social environment. Those five kinds of risks are further identified systematically to find the appropriate indicators to represent the characteristics of the risks. And finally a risk list is formed. The list is able to reflect the potential risks confronted the producers of dangerous chemicals in a realistic and all-round way. And it can also be used as a reference for making strategies on effective operation of shipping dangerous chemicals.

Acknowledgement

This work is supported by: Postgraduate research and innovation projects of Jiangsu Province (CXLX13_257): Research on the Evolutionary Path and Promotion Mechanism of Corporate Social Responsibility.

REFERENCES

[1] Liu Limei; Gao Yongchao; Wang Yongchun, *Journal of Chemical and Pharmaceutical Research*, **2013**, 5(9), 434-438.
[2] Guo Peijie; Jiang Juncheng, *Journal of Nanjing University of Technology*, **2006** (5), 57-62.
[3] Mazumdar, Harajyoti; Das, Rictika; Hazarika, Dibya Jyoti; Choudhury, Indrani; Ahmed, Hasanul Islam, *Journal of Chemical and Pharmaceutical Research*, **2012**, 4(2), 1370-1374.
[4] Yu Bin; Jin Yongxing; Zheng Jian, etc. *China Navigation*, **2011**(1), 86-89.
[5] Liu Yuanxin ; Zhuang Yan; Zhao Xing, *Journal of Chemical and Pharmaceutical Research*, **2013**, 5(9), 263-267.
[6] Yu Zhijua; Shenjia, *Logistics Technology*, **2008**(4), 55-58.
[7] Hassan Lone, Irshad; Kumar, Ajay; Khan, Fatima; Saxena, Shriparna; Iqbal Dar, Arshed, *Journal of Chemical and Pharmaceutical Research*, **2012**, 4(12), 5202-5214.