Establishment of Emergency Management System Based on the Theory of Risk Management

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Abstract

Through analyzing the whole four processes of risk management (RM), i.e. identification, assessment, control and recovery, a new understanding on RM is achieved. Hereafter the new realizes, the emergency management system (EMS) establishing was elaborated in this paper under the guide of legislation. Based on the RM theory, beginning from the risk identification, setting RM as the object, making the focal point on early warning and raising emergency response ability step by step, the emergency response plan would be practical. Getting change from rescue after an accident took place to precaution before an unexpected incident happens should be as the direction and main content for the establishment of EMS. In the paper, the relationship and difference between accident and incident is discussed, and a conclusion is given for studying the establishment of EMS.

Keywords: Risk, theory, Emergency, Management system

1. Introduction

Emergency management has become a very important research topic nowadays. With government and the society’s supports, the emergency management in enterprise has also developed from the emergency response and rescue for safety accident to the emergency management for four kinds of public emergency (namely accident, natural disaster, public health emergency and social security emergency). As directed by the principle “One Case, Three Systems” formulated by the government for the establishment of emergency management system (EMS), the enterprises EMS has been continuously strengthened. Following the Q-MS (quality management system, ISO9000) and HSE-MS (health, safety and environment management system, ISO/CD14690), EMS has become another important component of the overall management system of enterprises.

2. New realizes on risk management

It is generally believed that, emergency management aims at top events or accidents. In the National Emergency Response Program for Public Incidents, the term “emergency” is defined as follows: A critical incident which occurs suddenly and has caused or may cause major personal injury, property damage, ecologic-environment damage, serious...
social harm or serious public-security issue. In the course of formulation of emergency plan, the emergencies will be classified on the basis of their seriousness and then the corresponding response will be formulated for each kind of emergency. The seriousness of emergency is one main basis for calculation of risk, and is also an important basis for the classification of emergencies.

2.1. Understanding based on definition of risk

With respect to risk, different definitions have been given in different management system standards, but all these definitions are related to three factors, namely the hazardous factors, consequence seriousness and frequency of a specific incident. In consideration of the fact that different groups have different sensing capacity for risk and thus their judgment on danger varies one another, some recently-published monographs add another factor, namely sensing capacity [1]. This means that the risk management has developed from quantitative calculation to cultural management on behaviors.

The term “risk” is defined in the Risk Management Principles and Guidelines on Implementation [2] as the effect of uncertainty on objectives, is defined in the Specifications for HSE-MS [3] as the combination of possibility and consequence of a specific dangerous situation, and is defined in the HSE-MS for Oil and Gas Industry [4] as the possibility of occurrence of a specific hazardous incident and the seriousness of consequence thereof. It can be seen that, in order to study the emergency management, it is necessary to firstly understand the risk and analyze the object of emergency management (namely emergency) as well as the possibility of occurrence and seriousness of consequence, so as to decide which measures shall be taken, which resources shall be used and which procedure shall be followed for carrying out response and rescue actions.

2.2. Re-understanding on risk management theory

Accident is the result of unexpected incident, so that risk exists everywhere and emergency arises from risk. Various injuries and disasters occurring in industrial production will be finally embodied in the form of damage to life and property. The insurance business comes into being as a means to avoid and divert risks, and the competition over benefits promotes the research into and further development of risk management. Based on the research into risks and benefits, the risk management, developing from the experience-based judgment to the accurate calculation based on complicated data management model (DMD), has become a widely-applied subject.

The common risk management theories believe that, risk management includes three basic processes or procedures, namely risk identification, risk assessment and risk control. These three basic processes are also called as the three principles for risk management [1]. In fact, since the risks, the ability to identify risks and the measures to control risks are ever-changing, it is impossible for risk management to be limited to those three static and constant levels. According to the PDCA (plan, do, check, action) cycle mode, it is necessary to carry out dynamic management on risk. Therefore, since 1990s when HSE-MS was promoted [4], the understanding on risk management has been further improved through the intensified research into emergency management, and the original three processes have been gradually changed into four processes (identification, assessment, control and recovery). The introduction of this process makes the risk management theory better established, and also lays a theoretical foundation for the establishment of emergency management system.

2.3. Processes of risk management

The four processes of risk management, namely identification, evaluation, control and recovery, constitute a well-organized body. The risk identification mainly involves the identification of danger or hazardous factors, and is the basis and precondition of risk management; after the risks are fully identified and in accordance with the laws and regulations as well as the objective and acceptance level of an organization, the risks will be assessed, the harmfulness will be determined on the basis of seriousness of consequence and frequency of occurrence, and then the risks will be classified, so as to provide basis for the formulation and implementation of measures to eliminate or control risks; as a very important executive link in risk management, risk control involves the formulation of measures to eliminate or control risks as well as the implementation of such measures through training, regulation and supervision, so as to finally control those risks which have been identified and assessed within an acceptable level and scope; the last link of risk management is called as recovery, and in the risk management theory, risk recovery involves two aspects, namely the review on three preceding processes and the remedy for those unidentified potential risks or those control measures which may fail. Based on the understanding that risk recovery also involves remedy, many experts and scholars directly call the “risk recovery” as “emergency response.”
3. Establishment of emergency management system

In fact, any MS means a systematic management. In general, the term “system” is defined as an orderly combination of several components in accordance with some programs or plans [1]. In the Law of the People’s Republic of China on Emergency Response, the emergency response is divided into four management phases (namely prevention, preparation, response and recovery), which, in substance, considers the emergency management as a systematic full-process management. From the introduction of Q-MS and E-MS (environment management system, ISO14001) to the establishment of HSE-MS, PDCA principle has always been followed. Undoubtedly, the establishment of EMS shall also follow this principle, so as to ensure that this system will be integrated into the overall management system of enterprise and get continuously improved.

3.1. Emergency plan

Emergency plan is a pre-formulated plan which aims at some emergencies that may occur and ensures that the emergency response will be carried out in a prompt, effective and orderly manner.

Emergency plan serves as the policy, guideline and instruction in an established emergency system. As directed by the National Emergency Response Program for Public Incidents, the emergency plans of various kinds and at various levels will be improved gradually, the emergency plan system will be established, and the establishment of legal system for emergency management will get continuously improved, so that the emergency management based on the principle “unified leadership, comprehensive coordination, classified management, level-based responsibility and jurisdiction-based management” will come into being step by step, and the emergency management mechanism with the features of unified command, active response, complete functions, powerful coordination and highly-efficient operation will be set up.

The emergency plan system shall be established and improved level by level in accordance with the level of response. The emergency plan for a site or primary level where emergencies may occur, shall be based on the program for disposing of emergency or emergency procedure for the post; under urgent circumstance, it shall be concise, easily understandable, executable and practicable; the off-site emergency plan or the emergency plan of higher-level organization, which is also called emergency response plan (ERP) in some foreign countries and will mainly be taken as reference for emergency response, shall set forth the level of early warning and response on the basis of the analysis on possibility and seriousness of emergencies, determine the response responsibility and procedure, and prepare the corresponding resources; the emergency plan of government and headquarters of enterprise shall, as directed by the emergency-related guidelines and policies of the state, serve as the instructions for the emergency plans at various lower levels and realize the connection between various plans, so as to form the emergency plan system.

3.2. Emergency guarantee

Emergency guarantee involves rescue team, emergency materials and technical support, and shall be set forth in the emergency response plan. In some developed countries, three zones (namely hot zone, warm zone and cold zone) are set up for emergency response, rescue and off-site instruction, and there are strict restrictions and separation for the rescue personnel in different zones. For example, it is required that those rescue personnel which enter into hot zone must be the most professional in the aspect of skills, abilities and equipment, so as to ensure the orderly unfolding of rescue work and reduce unnecessary injury and death. With respect to the establishment of professional emergency rescue team and rescue base, the mode that the government, enterprises and volunteers make concerted efforts shall be advocated, and rescue teams and rescue bases shall be established and managed at various levels and in various regions, so as to ensure that rapid response may be made when emergency rescue is in need; with respect to emergency materials, the emergency materials shall be appropriately reserved in accordance with the principle “reasonable reserve for both normal and emergency circumstances,” and the joint-action & communication mechanism shall be set up through the concerted efforts of government and enterprises, so as to integrate the resources and ensure that sufficient emergency materials will be available in case of emergency.

3.3. Practices of establishment of Emergency management system in enterprise

Natural disasters, social security emergencies and public health emergencies will affect the production and operation of an enterprise, and the safe production of enterprises is also related to human life, environmental protection and social stability. Therefore, the emergency management system in enterprise will play a very important role in the emergency
management for the whole society.

The emergency management system of CNPC is composed of the following five sub-systems: emergency plan system, organization system, regulation system, rescue guarantee system and technical support system. Among these sub-systems, the emergency plan, organization and regulation sub-systems constitute the basic emergency management mode with the feature “three components in one body”, which complies with the requirements relating to “one program and three systems” and is compatible with the national emergency management system; the rescue guarantee and technical support, which supplement the emergency management mode with the feature “three components in one body”, aim to implement the emergency-related guidelines and policies of the enterprise, achieve the objectives of the enterprise, and improve the emergency response ability of the enterprise, so as to bring the emergency management system into full play.

4. Analysis on object of emergency management

Through the discussion above, the essence of emergency management is risk management, and all the processes of risk management aim at one specific element, namely hazardous incident. Accident is the specific result of incident. It can be found that, the change from traditional accident-based safety management to risk-based emergency management is the improvement of management concept and the advancement of practices.

4.1. Accident management

In practice, when talking about safety, accidents are always paid more attention to. This practice and understanding may be proven by the fact that the so-called safety management actually focuses on the investigation into responsibilities for accident. This is because that, according to the traditional management idea, safety is considered as the management on accident. This situation mainly arises from the traditional concept “No accident is safety, No damage is perfectness.” As a result, common people believe that it is safe if no accident occurs, and it is unsafe if any accident occurs. The safety management based on the concept “to mends the stall after calf is stolen” is a commonly encountered management mode whereby safety measures are taken after an accident occurs. Of course, the idea that accident may be taken as a resource has come forth over recent years, and according to this idea, the lesson obtained from accident may be used to learn safety measures. This “no repeated mistake” management philosophy is really a short cut for improving the safety management ability. In substance, however, this is the management on result rather than cause and process of accident, and the practices based on this management is the management on accident rather than the management on safety.

4.2. Incident management

The quantitative understanding on the concept “safety” is obtained only after the safety management developed from experience-based management to scientific management. On the basis of the understanding on risk management, the term “safety” is defined as “a state free from the damage at unacceptable risk.” The embodiment of safety depends on the state of incident rather than the accident, because risk is defined as “the combination of possibility and consequence of a specific dangerous incident.” The obvious difference between “accident” and “incident” is that, an accident has a specific result (such as injury or damage), and an incident has no specific result but may cause the above-mentioned result if the environment changes slightly. Therefore, the difference in management and disposal of “incident” may lead to different results: some incidents are properly controlled and no accident occurs, while some incidents are not properly disposed of and thus serious consequence occurs. As a result, we may identify the obvious difference between emergency management and traditional safety management. The former is the management on “incident,” while the latter is the management on accident. Undoubtedly, the emergency management which aims at incidents is much more active, scientific and practical than the traditional safety management which aims at accidents, and it represents the new working idea and working concept relating to safety management.

5. Conclusion

Through the analysis on accident and incident as mentioned above, the risk management theory should be used to give all-round instructions for emergency management. According to the risk management theory, an incident, if not properly managed, may develop into an accident or cause a crisis. Therefore, the risk management can be divided into three categories. The first category is the management on accident (namely the management on “confirmed” risks), the measures taken may be those as set forth in rules, regulations and operating procedures as well as the necessary measures for supervision, award and punishment, and this category is widely adopted in the safety management which is currently called
The second category is the management on incident (namely the management on “known” risks), the measures taken are to formulate emergency plan, make preparation for emergency, carry out emergency-related training and exercise, and improve the ability to make response to emergencies. The third category is the management on crisis management (namely the management on “unknown” risks), and owing to the high uncertainty arising from the unknown risks, the crisis is difficult to identify, highly dangerous and not easy to manage. For risk management, the measures taken are mainly scientific forecasting and cultural management to strengthen prevention. We shall, by improving the emergency response ability and crisis awareness of the whole society, overcome the fear, avoid blind behaviors, firmly build up the confidence in overcoming various difficulties among the whole society and even the human being, continuously research into and probe into the risk management theory, use the theory to direct our practices of emergency management, and lay a firm foundation for proper response to various possible crises.

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