Benefit Analysis of Double Prevention Mechanism of Enterprise Production under Economic Safety Management

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Abstract: At present, safety in production has become a common concern of all industries and enterprises. With the acceleration of industrialization and urbanization, all kinds of safety risks and hidden dangers are increasing day by day, and major accidents and disasters occur frequently, which seriously threaten people's lives and property and seriously affect economic and social development. Strengthening the management of safety production and preventing and reducing safety accidents have become an urgent task in the safety field. The purpose of this paper is to apply the double prevention mechanism to the field of safety production, so that it can have a comprehensive understanding of safety production risks, and then formulate corresponding prevention and emergency measures, thus improving the risk awareness and management level of enterprises.

Keywords: enterprise safety in production; Double prevention mechanism; Risk management; safety measure

Introduction

Nowadays, with the globalization and the intensification of market competition, the economic risks and security problems faced by enterprises have become more and more complicated. In order to effectively meet this challenge and ensure the long-term and stable development of enterprises, enterprises must strengthen their economic safety management. Economic security management not only includes all kinds of external risks faced by enterprises in production and operation, but also includes the optimization of internal governance mechanism of enterprises [1]. Double prevention mechanism is the need of enterprise risk management, and its purpose is to reduce the impact of risks on enterprises by building a systematic prevention system. The mechanism mainly includes two aspects: one is to predict and control all kinds of risks in advance, and the other is to monitor and adjust preventive measures in time and effectively. However, although China has initially established the theoretical framework of the double prevention mechanism, in practice, how to effectively implement and optimize it is still an important issue.

1 Overview of Dual Prevention Mechanism

"Double prevention" mechanism is a comprehensive safety management idea, and its purpose is to fundamentally reduce the occurrence of safety accidents. As shown in Figure 1:

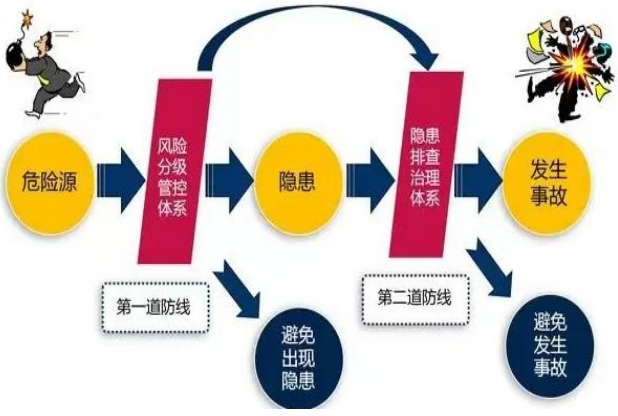

Figure 1 Dual prevention mechanism

Risk grading management and control is an important part of the dual prevention mechanism. Risk classification control is to classify and evaluate all kinds of security risks according to the possibility and severity of risks, and take

corresponding control measures to minimize the losses caused by risks to enterprises [2]. As shown in Figure 2:

Figure 2 Risk classification management and control process

Risk classification management and control requires comprehensive and systematic identification and evaluation of various security risks. Including a comprehensive investigation of the internal production process, equipment, personnel behavior and other risks, analysis of external environment, policies, regulations and other factors. On this basis, various risk factors are analyzed and evaluated, and the key risks that have a significant impact on the company are found out. According to different risk levels, enterprises can adopt different control methods.

Hidden trouble investigation and management requires the establishment of a systematic and comprehensive hidden trouble investigation mechanism. This includes regular and comprehensive inspection and investigation of potential safety hazards in all links and departments within the enterprise to ensure a full understanding and grasp of potential risks. Only by establishing a perfect security hidden danger investigation system and standardizing the inspection process can hidden dangers be discovered in time. The investigation and management of hidden dangers should formulate targeted rectification measures. Once a potential safety hazard is found, it is necessary to make a rectification plan in time, clarify the responsible subject, and clarify the rectification time limit. In view of different types and grades of security risks, corresponding rectification measures are put forward to ensure timely and effective rectification [3].

2 The Application Value of Double Prevention Mechanism in Safety Production

2.1 Contribute to the Enhancement of Effective Risk Prevention and Management Capabilities

Through pre-evaluation and hierarchical control of risks, enterprises can identify and evaluate potential safety hazards and take corresponding control measures. Risk prevention measures include regular inspection of equipment, maintenance of the system, and formulation of operating procedures to effectively prevent the probability of accidents. For example, in oil refining enterprises, through regular inspection and maintenance, potential leakage risks can be found in time and maintenance measures can be taken in time to avoid major accidents [4]. At the same time, the dual prevention mechanism has further strengthened risk control, established a real-time monitoring system and formulated an emergency plan. This multi-level risk management strategy can effectively reduce the accident rate and improve the overall safety level of enterprises.

2.2 Taking into Account both Ex-Ante Risk Control and Ex-Post Risk Response

Establishing and perfecting emergency plans and conducting emergency drills regularly are important means to reduce the impact of accidents on production and environment. The emergency plan should not only cover the comprehensive emergency handling process, but also clarify the division of responsibilities of various departments and personnel, and rationally allocate resources to ensure that emergencies can be responded quickly and effectively. For example, if there is an oil spill accident, the emergency plan can be started in time, which can quickly block the leak and recover the oil spill, which is of great significance to environmental pollution and resource waste. By implementing this mechanism, enterprises' emergency response ability can be improved, environmental risks and economic losses can be reduced. At the same time, through regular drills, relevant personnel can be familiar with the process of emergency plan and enhance their emergency response ability, so as to deal with

emergencies more calmly and effectively. It can be seen that making emergency plans is an important guarantee for safety management.

2.3 Help to Strengthen the Construction of Enterprise Safety Culture And Staff Training

Implementing the "double prevention" mechanism can enhance employees' safety awareness and improve their safety production level. Among them, systematic safety training for employees and regular emergency drills not only enhance employees' safety awareness, but also enhance their ability to deal with emergencies. The training content includes accident handling procedures, operating procedures and emergency handling, etc. Through actual operation and drills, employees are equipped with necessary safety skills. Taking oil refining enterprises as an example, routine emergency drills and safety training can enable employees to respond to crude oil leakage quickly and effectively reduce the danger caused by human error. In this way, enterprises can form a strong sense of safety among employees, and then form a good safety culture, so as to further improve the overall safety management level.

3. Practical Application of Double Prevention Mechanism in Safety Production

3.1 Case Overview

A serious oil spill occurred in the refinery of a petrochemical company. This oil refinery is one of the largest in this area, and it has a huge oil storage and processing equipment. When the accident happened, it was at the peak of production, and crude oil transportation and processing were being carried out normally at present. Suddenly, an oil storage tank leaked, and a large amount of oil flowed out quickly, forming oil slurry. Because the leakage point is close to the waters around the factory, some oil spills flow into the river, which has a serious impact on the surrounding environment.

3.2 Specific Application Process

1. Risk classification

(1) Risk identification and assessment: Before the accident, the refinery had made a comprehensive risk assessment of its oil depot and related processing equipment. Oil refining enterprises use advanced risk assessment methods such as failure mode and impact analysis, hazard and operability analysis to identify potential safety hazards of oil refining enterprises. Oil storage is an important production facility, and its risk level belongs to high-risk area, which mainly depends on the scale of oil storage and its impact on the surrounding environment.

During the evaluation process, the refinery paid great attention to the structural stability, sealing and safety protection measures of the oil depot. Through the analysis of historical data and accident cases, the evaluation team found that in the long-term operation process, the oil depot may have problems such as equipment aging, seal failure and accidental damage. In addition, the increase of operating load during peak hours will also lead to accidents. On this basis, oil refining enterprises have formulated specific risk control schemes, and put emphasis on strengthening the monitoring and maintenance of oil depots.

(2) Formulation and implementation of risk control measures: In view of the identified risks, oil refining enterprises formulate corresponding risk control measures. Including regular inspection of the oil storage tank to ensure the normal operation of all equipment. Pay special attention to the tightness of the oil storage tank to prevent leakage caused by seal failure. Install an advanced leakage monitoring system to monitor the situation of oil warehouses in real time [5]. The system can detect tiny leakage and give an alarm in time, so that it can take preventive measures before the leakage occurs. Increase the frequency of inspections during peak hours to ensure that operators can find and solve hidden dangers in time. Make strict inspection standards for equipment, and record the operation of equipment. Hold regular safety training and emergency drills for employees to improve their resilience. The contents of the exercise include equipment fault handling, leakage accident handling, personnel evacuation and so on.

(3) Formulating and rehearsing the Emergency Plan: Formulating the emergency response procedures for spilled oil, including oil recovery, environmental protection measures and evacuation. The emergency plan specifies the disposal steps and responsibilities of various emergencies in detail to ensure that emergencies can be handled quickly and effectively. Formulate a set of detailed evacuation procedures, including evacuation routes, assembly locations and evacuation instructions, to ensure that people can evacuate from the accident site quickly and safely.

Organize emergency drills regularly to ensure the effective implementation of the emergency plan. The contents of the exercise include oil spill accident simulation, equipment failure and environmental pollution, so as to improve the emergency response ability and emergency response ability of employees. After the exercise, oil refining enterprises can continuously optimize the emergency plan to ensure that they can respond quickly in case of unexpected events.

2. Hidden trouble investigation

(1) Investigation of potential safety hazards: Although oil refining enterprises have implemented risk classification control, they still failed to find and eliminate potential safety hazards in time when accidents occurred. After the accident, oil refining enterprises quickly started the investigation mechanism of potential safety hazards. The investigation of potential safety hazards mainly includes: comprehensively inspecting the equipment at the accident site and around it, and determining the specific location and cause of the leakage. Check the structure, sealing material and pipeline connection of oil tank to find out the cause of oil leakage. Analyze the data recorded by the leakage monitoring system to check whether there are monitoring blind spots or abnormal data. Check whether the operation of the system is correct, and whether there is any error or setting error. Review the operation records during the peak production period and judge whether there is any improper operation or management error. Check whether the operators operate according to the regulations and whether there is any violation of the regulations.

(2) Treatment of hidden dangers after the accident: plug the oil leakage point at the first time to avoid more oil leakage. Use emergency plugging equipment and materials to quickly control the leakage source. Organize professional teams and use professional equipment to recover oil spills. By setting up oil barriers and adopting adsorption materials, the oil spill can be recovered to the maximum extent and environmental pollution can be reduced. Deal with the leaked crude oil to prevent it from spreading to the surrounding environment. Interception facilities are set up in the river to clean up the oil pollution in the river, thus effectively protecting the water environment. Conduct a comprehensive inspection of the equipment in the accident area and eliminate other possible safety hazards.

(3) Adjust and optimize the preventive measures: improve the sensitivity of the monitoring system, improve the coverage of the monitoring system, and ensure that tiny leaks can be found in time. In order to improve the reliability of the system, backup, backup and other functions have been added. Conduct more inspections on key equipment and high-risk areas to ensure the real-time status of equipment. Formulate more detailed inspection standards and record requirements, and find and deal with potential hazards in time.

The plan was revised and optimized on the basis of the experience in handling unexpected events. The content of emergency plan has been increased, and the ability to deal with similar emergencies has been improved. Strengthen safety training for employees, especially new equipment and technology. Improve employees' ability to identify and deal with potential hazards, and ensure quick response when accidents occur.

4 Double Prevention Mechanism Application Benefit Analysis

The research shows that applying the dual prevention mechanism to the treatment of oil spill accidents in oil refining enterprises can significantly improve the efficiency of accident response, reduce environmental pollution, and reduce economic losses and safety risks. The details are as

follows:

4.1 Environmental Benefit Analysis

Before the accident, the concentration of crude oil in the river was only 0.45 mg/L. After the oil spill was cleaned up in time, the concentration of crude oil dropped to 0.15 mg/L, a decrease of 66.67%. This obvious reduction shows that the prevention mechanism is effective in controlling environmental pollution. The oil spill area decreased by 77.14%, from 3500 square meters to 800 square meters. The area of land polluted by oil pollution decreased by 79.17%, from 1200 square meters to 250 square meters. In addition, the total cost of environmental remediation was reduced from 1.2 million yuan to 400,000 yuan, a decrease of 66.67%. The reduction of this cost also shows the effectiveness of the dual prevention mechanism in reducing the cost of accident handling and environmental restoration.

Table 1 Changes of environmental pollution indicators before and after the accident

index	Value before accident	Post-accident value	Reduction ratio (%)
Oil concentration in river water (mg/L)	0.45	0.15	66.67
Oil spill area (m)	3500	eight hundred	77.14
Oil-contaminated soil area (m)	1200	250	79.17
Environmental restoration cost (ten thousand yuan)	120	40	66.67

4.2 Economic Benefit Analysis

From the economic point of view, the effect of dual prevention mechanism is also very significant. The direct economic loss of the accident decreased by 64.00%, from 50 million yuan before the accident to 18 million yuan. The cost of maintenance and cleaning decreased from 1.2 million yuan to 400,000 yuan, a decrease of 66.67%, reflecting the effectiveness of preventive measures in reducing the cost of accident handling. The economic loss caused by the suspension of production decreased from 20 million yuan to 8 million yuan, a decrease of 60.00%. The cost of emergency response has also decreased from 500,000 yuan to 250,000 yuan, a decrease of 50.00%.

Table 2 Changes of economic losses and expenses before and after accident treatment

project	Pre-accident estimate (ten thousand yuan)	Actual after the accident (ten thousand yuan)	Reduce the proportion (%)
direct economic loss	5000	1800	64.00
Repair and cleaning costs	120	40	66.67
factory shutdown losses	2000	eight hundred	60.00
Emergency response cost	50	25	50.00

4.3 Safety Benefit Analysis

The dual prevention mechanism also plays an obvious role in promoting safety management. Before the accident, the frequency of safety inspection was eight times a month. After the accident, the frequency rose to twenty times, an increase of 150.00%. This upgrade shows the importance of strengthening safety inspection measures when preventing accidents. The accident response time was shortened from 60 minutes to 30 minutes, a decrease of 50.00%. The system failure rate decreased from 10.5% to 2.0%, a decrease of 81.90%. The data shows that the reliability of the test system has been greatly improved due to the improvement of system maintenance and monitoring means. The coverage of emergency training for employees increased from 70% to 95%, an increase of 35.71%.

Table 3 Changes of key indicators of safety management before and after the accident

index	Value before accident	Post-accident value	Promotion ratio (%)
Frequency of safety inspection (times/month)	eight	twenty	150.00
Incident response time (minutes)	60	30	50.00
Failure rate of oil leakage	10.5	2.0	81.90

detection system (%)			
Coverage rate of employee emergency training (%)	70.0	95.0	35.71

5 Conclusion

Safety in production is the social responsibility that every enterprise must bear. The double prevention mechanism is an intuitive and systematic safety management tool, which can make companies more aware of the importance of safety management and establish the idea of safety first, thus promoting the company's sustainable development and promoting social stability and prosperity.

At present, the double prevention mechanism method is mainly used in chemical, petroleum, mining and other industrial fields, but it will be widely used in the future, such as transportation, medical care, environmental protection and so on. In the future, with the continuous progress and development of science and technology, the double prevention mechanism method will be more widely used in the field of safety management. Combined with the characteristics of the industry, give full play to its advantages and provide personalized safety management solutions for different industries. Help enterprises solve the challenges and problems they face, and jointly improve the safety management level and reduce the accident rate through experience exchange, technical exchange and collaborative research.

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