Research on Construction of Safety Performance Measurement Index System Based on Mathematical Model in Computer Environment

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Abstract. The construction of safety performance measurement index system about a company's ability to fight the accident risk, in recent years, safety performance measure system caused the attention of many businesses, has become a hot topic, also caused the attention of many businesses, safety theory and methods of safety management of research and development are in the service of the production practice, the ultimate goal is to reduce accidents, reduce accident loss, reduce casualties, improve security, and enhance the level of security, and safety performance is the effect it has enterprise safety in production work, improve safety performance will bring the improvement of safety production, The standardized management system of work safety and the safety performance management system are common management systems of work safety.

Keywords: Safety Production Standardization, Safety Performance Measurement Index, Accident Risk, Safety Management Method

1. Safety production management system

Production safety management is to manage people, machine, material and environment in the process of production in order to ensure their harmonious operation. With the development of the society, management is gradually modeled and systematized, among which the safety production standardization management system and safety performance management system are widely used.

The former is through the establishment of the safety production responsibility system, the formulation of safety management system and operation rules and other norms of production behavior, so that all production links meet the requirements of relevant laws, regulations and standards of production safety, and continue to improve, constantly strengthen the standardization of enterprise production safety construction; The latter is a circular process that combines various objectives and systems of safety production, obtains measurable results through evaluation and other means, and applies the assessment results to achieve continuous supervision. The safety performance management system has been studied and practiced in many foreign countries, while the safety production standardization management system is mostly applied in domestic enterprises\(^1\).

1.1. Mechanism and differences

The management of production safety is to reduce and control hazards and accidents to achieve the
purpose of production safety. The two types of management systems have different mechanisms to act on production safety. The reasons are as follows: The occurrence of accidents has its development rules and characteristics. The famous theory is Heinrich's causal chain theory of accidents, which emphasizes the "human" factor, that is, the control of the "human" factor can control the occurrence of accidents. On this basis, Frank Bird proposed the modern causal chain theory of accidents, emphasizing more on the factor of "management", which is the beginning of all accidents. The comparison of the two theories is shown in Figure 1. The two chain reaction theories have in common the domino principle: remove one factor, the chain reaction will be stopped, and an accident can be avoided, but the mechanism is distinctly different\cite{2}.

![Figure 1. Theory of accident cause.](image)

![Figure 2. Closed-loop linkage system.](image)

2. Establishment of safety performance assessment method for all employees

2.1. Different forms
There are three kinds of application forms of safety performance: one is to directly define safety performance by the occurrence and consequences of production safety accidents; The second is to consider the operation effect of the safety work with the practical performance of the enterprise; The third is the combination of the two. The first is the assessment based on accident situation (passive measurement) For example, many companies will sign annual safety assessment targets and set a minimum level of accident occurrence, which will be used as the basis for the assessment. The second type is assessment based on inspection results (active measurement) For example, the data of Dupont shows that its safety management evaluates the operation effect of various safety activities through a set of audit system covering different contents such as documents, personnel, site, headquarters, departments, etc., and then turns the audit results into safety performance for application.

2.2. Performance creation
Chengdu Chengzhicheng Logistics Co., LTD., as a subsidiary of Chengdu Branch of Sichuan Tobacco Company, adopts the standardized management system of safety production and applies target management. The main business is warehousing and distribution, which involves a lot of line operations, so process control is particularly important.

In order to further refine the responsibilities and deepen the supervision of safety performance in the production process, the logistics company decides to explore and build a third form of safety performance application form to achieve the dual control of production "target" and "process".

2.3. Practical achievements
At present, the application of total safety performance has shown the following advantages: 1. The safety management cognition of "I want to be safe" is reversed to "I want to be safe", and the safety production consciousness of all staff is firmly established. Second, the position of the standard grounding gas. Through the establishment of 19 sets of assessment rules covering 7 departments and facing each position, the safety responsibilities and requirements of each position are clarified, so that each employee is more aware of the safety responsibilities and obligations of his/her own position. Third, Li Zha li to change the foundation of tamping. After half a year's assessment, 60 hidden safety hazards were found in total, and 59 rectifications were completed in time, thus laying a solid foundation for safety management. Fourth, assessment rectification is of strong significance. From smoking and parking in the park to defining and dealing with accidents, the importance of routine inspection and rectification of hidden dangers is further emphasized, which reflects the theme of "all staff participation and everyone's responsibility".

3. Existing problems and improvements
Although some achievements have been made after the application of all-staff safety performance, this work is still in continuous practice and improvement, and the main problems are as follows:

First, in terms of the assessment situation, it is necessary to change from relying on the inspection by superiors and traffic police fines and other rigid "problems" to the "flexible" mode of irregular self-supervision and self-assessment of each department, which reflects the safety management responsibilities of each department. Second, the content of the assessment, part of the terms are not perfect, clear, need to be further improved and clear. Thirdly, in terms of the strength of assessment, many clauses do not have a strong point deduction, which mainly serves as a warning and reminder, but may cause the staff to feel that the punishment is relatively light and not pay attention to it. Fourth, in the scope of assessment, the constraint and control of the third party personnel should be further optimized.

There is no right or wrong safety performance, only good and bad, applicable and not applicable, so it is very necessary to find the safety performance applicable to most enterprises. At present, many domestic enterprises are still in the initial stage in the application of safety performance management, and there are many problems. The result indexes such as casualty number and economic loss are often used to investigate the effect of safety management. The accident rate is used to judge the safety
work of enterprises. However, the low accident rate at present cannot fundamentally guarantee that there will be no accidents later, which leads to the incomplete safety assessment and performance assessment. Therefore, enterprises urgently need a set of safety management performance review standards to help themselves to better achieve security management. The purpose of performance evaluation of enterprise safety management does not emphasize how enterprises conduct safety management, but to evaluate the effect of safety management according to the evaluation index system, so as to realize the supervision function of enterprises (Fan Yunxiao, 2013). From the perspective of enterprises, the establishment of safety management performance evaluation method can help enterprises find out their own shortcomings, evaluate the status quo of their security management, and thus determine the direction of improvement. From the perspective of society and country, the development of safety management performance evaluation method can span the gap between industries and enterprises, facilitate the comparison between each other, so as to achieve the purpose of accident prevention, reduce the occurrence of accidents, and create a good safety environment.

After continuous exploration by predecessors, a set of "suitable for different industries" has been preliminarily determined at present. A process-based index system. However, according to the index system, how should each index be evaluated and how to judge the performance of enterprises in a certain index have not been studied in depth by scholars. However, the enterprise safety management performance evaluation method can evaluate the safety management level of enterprises before the accident occurs, and find out the safety problems existing in enterprise management, so as to find out the problems in advance. Solve the problem so as to achieve the purpose of accident prevention. However, China has not yet such a set of assessment tools for the use of enterprises, so it is necessary to develop such a set of assessment tools to measure the safety management performance of enterprises. As a kind of evaluation method, standardization not only overcomes the deficiency of inter-volume survey and reduces the influence of subjective factors of the tested, but also can obtain real and reliable data with a standardized scale and obtain evaluation results. Therefore, on the basis of the evaluation index system, it is very necessary to establish a set of evaluation standards to cross the gap between various industries or enterprises.

4. Conclusion
Safety performance is based on the objective and policy of enterprise safety production, combined with the actual production situation, the use of scientific theoretical methods, the enterprise safety production work to achieve a quantifiable evaluation. In short, it is the measurable result obtained in the work safety according to the work safety goal. Safety performance is a sub-system of enterprise performance and an important embodiment of enterprise safety management level. At present, many enterprises have regarded good safety performance as an important factor to measure their market competitiveness. Based on the analysis of the deficiencies existing in the safety performance evaluation of Chinese enterprises at present, the improvement methods are put forward, and the practical cases of the establishment of safety performance evaluation system in limited companies are combined to discuss how enterprises should do a good job in safety performance evaluation, so as to promote the continuous improvement of the level of safety production. In the past, single outcome indicators such as the occurrence of accidents were used as the evaluation method for the continuous safety performance of enterprises, and a comprehensive, systematic and diversified enterprise safety performance slave price system was established. The comprehensive analysis of the indicators such as personnel quality, safety basic management, equipment and facilities and accident status that affect the safety performance of the enterprise can directly reflect the overall safety performance of the enterprise. At the same time, qualitative and quantitative analysis using fuzzy comprehensive evaluation method can to a large extent avoid the impact of personal subjective factors on the evaluation results. So that the enterprise performance evaluation results more objective and reasonable.

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