Incentive-driven Safety Performance Appraisal Strength of Municipal New-energy Industry

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Abstract: Performance management and appraisal is an important part of enterprise safety management system. This article takes typical companies in the municipal new-energy industry as representatives, and conducts statistics and analysis on how to evaluate the strength of safety performance management or incentives-based incentive model. Through a comparative study of negative incentives of resulting performance indicators in single municipal new-energy industry as well as varied industries including construction engineering and metallurgy, the paper summarizes the characteristics of performance appraisal strength in enterprises from the three industries. The statistical and analysis results are able to provide a reference for the implementation of reward and punishment measures, which may further enhance the safety awareness of employees at all levels of the municipal new-energy industry, and also raise a useful guide for companies to improve safety management.

1 INTRODUCTION

Incentive is a process in which the organization stimulates, guides, maintains and standardizes the behavior of the members by means of communication through appropriate reward forms as well as certain codes of conduct and punitive measures with the aim of achieving the established goals of the organization and the individual (Wang 2013). Incentive measures are generally divided into two types. One is positive incentive measures, including honor incentive, goal incentive, demonstration incentive, material incentive. The other is negative incentive, which is mainly to give warning, economic punishment, demotion, dismissal, probation, dismissal and other penalties to employees or departments who commit mistakes, violate enterprise rules and regulations, delay work, damage equipment and facilities, cause economic losses to the enterprise and damage the reputation of the enterprise.

Safety incentive refers to the management of safety production for enterprise organizations and individuals through incentive theory to improve the overall safety level of the enterprise. In the work of safety production and disaster prevention, the establishment of incentive mechanism for personnel and departments at all levels has become one of the most direct and effective methods of safety management (Gao 2018). At present, the commonly used safety incentive theories mainly include X-Y theory and two-factor theory, and the detailed description of the basic ideas of the two theories is shown in Figure 1.

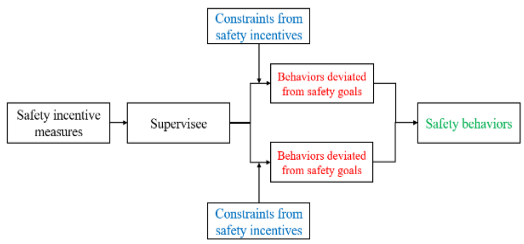

Figure 1: Theory of safety incentive.

In modern enterprise production process, safety incentive has become fully mobilize employees to the

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core of production safety measures. In the process of municipal new-energy safety, fully motivated employees attach great attention to safety problems and have much interest in seeking solutions. From the safety production results, the frequency and severity of accidents in companies with better implementation of safety incentives are highly reduced. To sum up, the role of safety incentive in enterprises is four aspects (Duan 2007).

In order to achieve safe production of municipal new-energy engineering project with high quality, enterprises must have a clear driving force and constraints. To realize this, we always need to introduce incentive mechanism to fully arouse the enthusiasm and subjective initiative of each production safety practitioners, that is, motivating employees to do a good job of safety by means of economic and administrative strategies. In this respect, the realization of the goal for safe production is closely related to each person's economic interests. For those who has achieve the target, they will get some rewards. While for those who fails to reach the target, they will definitely get a punishment. In this way, incentive intensity, indicating the strength of safety performance appraisal, is highly vital for bringing about safety behaviors consistent with the safety production goal pursued by the enterprise (Zhang 2015). Thus, in this work, a novel method is raised based on motivation theory to measure the safety performance appraisal strength, which is aimed at helping to promote safety management and stay away from disasters throughout the new-energy enterprise.

2 SAFETY PERFORMANCE ASSESSMENT SYSTEM AND INCENTIVE INTENSITY DIVISION

2.1 Concept

Safety performance assessment refers to using scientific standards, methods and procedures to evaluate the behaviours, achievements and final actual performance of the organization, department or staff as accurately as possible. There are four basic performance appraisal methods, namely key performance indicators, balanced scorecard, 360-degree performance appraisal and management by objectives. According to relevant literature review (Hu 2008), this paper defines safety performance as the combination of safety construction state and the final consequences of safety accidents. The comprehensive results of contents of the above two can more completely and accurately reflect the state of enterprise safety performance.

2.2 Safety Performance Appraisal System

To adopt scientific and reasonable evaluation methods to more accurately evaluate the safety performance of different enterprises, it is necessary to start from the process of safety production and the consequences of accidents. In the whole evaluation process, the safety of municipal new-energy engineering projects is the key point emphasized by the enterprise. Reasonable design, control and adjustment of the safety production process are necessary means of realization. Enterprise safety performance assessment is a complete operation process, which generally should include five procedures, that is, the establishment of enterprise safety objectives and indicators, the determination of index weight, safety production performance evaluation, and the feedback of assessment results. When the process of safety performance assessment of an enterprise is completed, it will proceed to the establishment and determination of enterprise objectives in the next stage, thus forming an assessment cycle (Duan and Chen 2010).

Based on the idea of strengthen source prevention, pay attention to process management and give consideration to result control, it makes the scope and nature of enterprise safety production management work more clear, so that enterprises are able to take corresponding measures to prevent the occurrence of accidents and ensure the safety production (Sun 2019). Considering the authority and universality of accident classification in China, we take the accident occurrence degrees (ordinary accident, larger accident, major accident and extraordinarily serious accident), which belongs to the category of result control, as indicator of safety performance evaluation in this paper, as shown in Table 1.

Table 1: Accident classification.

Degree	Classification Standard
Extraordinarily serious accident (ESA)	More than 30 deaths, or more than 100 serious injuries, or more than 100 million yuan of direct economic loss
Major accident (MA)	10-30 deaths, or 50-100 serious injuries, or 50-100 million yuan of direct economic loss
Larger accident (LA)	3-10 deaths, or 10-50 serious injuries, or 10-50 million yuan of direct economic loss
Ordinary accident (OA)	Less than 3 deaths, or less than 10 serious injuries, or less than 1000 million yuan of direct economic loss

2.3 Incentive Intensity Division

According to the model of incentive theory put forward by the famous North American psychologist and behavioral scientist Victor Froom in <Work and Incentive> in 1964, we can effectively quantify the incentives within the enterprise:

$$\textit{Incentive force} = \textit{Expected value} \times \textit{Valence} \quad (1)$$

Expected value can be understood as a tendency of an organization or an individual to achieve a goal, that is, an expectation level for different degrees of accidents in safety management. Valence indicates the satisfaction of individual for achieving goals. During typical safety work, valence means incentive measures (economic and administrative incentives). Through the intuitive assignment calculation of these two concepts, we would have a straightforward understanding of incentive intensity. Combining with the research content of this article, we set the expected value of the formula to be negative, that is, the expected level of avoiding different degrees of accidents. While for valence, we decide to calculate it using the weight integration with negative incentive means prescribed by the enterprise.

Specifically, we have to determine the degree of accidents first according to the number of deaths and economic losses. In order to make the final results more intuitive, the grading method is adopted to assign the score of each accident. The accident degree rating table is shown below.

Table 2: Rating rule for accident degrees.

Degree	Score
Extraordinarily serious accident (ESA)	8
Major accident (MA)	4
Larger accident (LA)	2
Ordinary accident (OA)	1

After determining the degree of the accident, we need to conduct a further quantitative analysis of the negative incentive by the incentive mechanism after accident, which makes the final summary and comparative analysis clearer. To unify the process of negative incentive evaluation, this paper scores the level of punishment measures of different enterprises in the municipal new-energy industry and other mainstream industries. Based on the punishment measure level, the score from light to heavy can be assigned with 1 to 10, in which 1 represents the lightest punishment measure while 10 denotes the heaviest one. The grading standard of punishment is shown in Table 3.

Table 3: Rating rule for punishment measures.

Form of Punishment	Punishment Measures	Score
Economic punishment	10000-20000 yuan	3
	20000-40000 yuan	5
	More than 40000 yuan	7
Administrative punishment	Warning	1
	Demerit recording	2
	Major demerit recording	3
	Demotion	5
	Dismissal	7
	Expulsion	9

In order to facilitate the comparison and statement of the calculated incentive intensity, we define the value of incentive force with the corresponding level after expert brainstorming and the investigation of employees in the enterprise.

3 SAFETY PERFORMANCE APPRAISAL STRENGTH IN DIFFERENT INDUSTRIES

3.1 Safety Performance Appraisal Strength in Municipal New-energy Industry

Municipal new-energy enterprises are different from general production enterprises. They have the characteristics of large investment, long cycle and high professional integration. To get rid of backward management system and implement correct strategies, it is necessary for municipal new-energy enterprises to establish their own performance assessment system (Zou 2016). Under this circumstance, we scored the both economic and administrative punishments of domestic mainstream municipal new-energy enterprises *A*, *B*, *C* and *D*, and weighted the average according to the equally important weights. The average score is exactly regarded as the valence. After multiplying the expected value and valence, the final scores of incentive force (incentive intensity) are obtained and shown in Table 4.

Table 4: Safety performance appraisal strength in municipal new-energy industry.

Object of Punishment	Enterprises	Accident Classification			
		OA	LA	MA	ESA
Person mainly responsible for the accident	*A*	4.75	11	32	68
	B	5	13	30	64
	C	5	11	32	68
	D	4.5	13	32	68
	Average	4.8125	12	31.5	67
Secondary person responsible for the accident	*A*	4	10	32	64
	B	4	11	30	60
	C	4.5	10	28	60
	D	4.5	11	30	68
	Average	4.25	10.5	30	63
Head of department responsible for the accident	*A*	4	10	24	64
	B	3.5	12	26	60
	C	4	8	22	52
	D	3.5	10	26	64
	Average	3.75	10	24.5	60
Principal of the enterprise	*A*	3.5	10	22	52
	B	3.5	11	28	64
	C	2.5	5	20	40
	D	3	8	22	44
	Average	3.125	8.5	23	50

From the results above, it can be seen that among the negative incentives for the main responsible person, secondary responsible person and department responsible person of the accident, the incentive force of enterprise D is relatively large compared with the other three enterprises. Among the negative incentives for main responsible persons (principal), enterprise B has the largest incentive force. After the accident, the municipal new-energy industry has different motivation for different responsible people, in which the order from large to small: the main responsible person of the accident, the secondary responsible person of the accident, the head of the department responsible for the accident, principal of the enterprise (project).

3.2 Safety Performance Appraisal Strength in Varied Industries

In order to better provide suggestions and ideas for the establishment of safety performance incentive mechanism for enterprises in municipal new-energy industry, we select enterprises which are representative in metallurgical and construction industries in China to further conduct comparative analysis of incentive intensity. The numerical results of safety performance appraisal strength are shown in Table 5.

As can be seen from the above data, in OAs and LAs, the incentive force of metallurgy industry and construction industry to different responsible persons is obviously greater than that of municipal new-energy industry, but all of them has a same ordinary incentive level. Thus, taking the analysis as a key reference, municipal new-energy enterprises should increase the level of economic and administrative punishments for varied responsible persons with respect to ordinary and larger accidents while reducing the expectation of accident occurrence, so as to arouse the crisis awareness of principals for continuously improving the enterprise safety performance.

Table 5: Safety performance appraisal strength in varied industries.

Object of Punishment	Industries	Accident Classification			
		OA	LA	MA	ESA
Person mainly responsible for the accident	Municipal new-energy	4.8125	12	31.5	67
	Metallurgy	4.92	11.67	36	72
	Construction engineering	4.9	14	28.67	64
Head of department responsible for the accident	Municipal new-energy	3.75	10	24.5	60
	Metallurgy	4.17	10.67	35	70
	Construction engineering	4.75	14.5	28	62.67
Principal of the enterprise	Municipal new-energy	3.125	8.5	23	50
	Metallurgy	4.53	11.30	34	68
	Construction engineering	4.5	14	28	53.15

4 CONCLUSIONS

In this paper, the incentive strength of safety performance was measured and analyzed subjected to different new-energy enterprises in municipal new-energy industry as well as different industries including metallurgy and construction engineering. It is found that the incentive level of municipal new-energy industry to different responsible persons is not sufficiently high so that the economic and administrative punishments should be strengthened. In addition, appropriate implementation of safety incentives based on varied degrees of accidents is really needed for standardizing the safety behavior of employees and ensuring the stable enterprise development.

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