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Safety Interventions Evaluation in an Oil and Gas Company

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Abstract

In low safety performing companies, the management was perceived to be more interested in keeping their safety records than preventing accidents; employees were inadequately trained for their jobs, and were not collectively setting goals for safety. Contemporary safety and health program have over the years been based on theoretical and qualitative analysis. This has prevented industrial organizations and companies from adequately developing and implementing successful health and safety intervention programs aimed at decreasing or eliminating incidents. In an attempt to improve the working environment, several researchers have suggested the creation of a safety culture which enables management to develop hazard free workplace. In this research, a model of effective safety and health program has been developed that incorporates qualitative and quantitative techniques to relate past incident rates, safety resources allocation and intervention activities. The outcome of the research work is to predict the effectiveness of safety resources allocation in implementing safety intervention activities; this will in turn minimize the cost of incident prevention initiatives.

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1. Introduction

Over the years, most companies realized that the traditional intervention methods have fallen short of providing the expected outcomes and results. The failure of the safety practices have led to the need to redefine the safety activities which should be incorporated into a particular safety and health program. This has also led to the need to determine the level of resources to be allocated to the implementation of the safety and health program. Most behavioral based studies have considered intervention as a single factor which failed to observe the interactive effects of other safety activities. The evaluation and implementation of a single intervention factor could be justifiable in situations where the other interactive factors are assumed constant. In 1995, in the study conducted by the Human Factors in Reliability Group of the United Kingdom Health and Safety Executive, the role of unsafe human behaviors was considered as the major contributory factor in industrial or workplace accidents. Four types of unsafe behaviors were highlighted and management oriented intervention was recommended as the applicable solution. Their study provided a safety audit survey technique which incorporated a questionnaire and interview system to identify areas of the safety program which needed to be improved [1]. The use of qualitative technique in the analysis of safety behaviors of the employees did not produce any meaningful results to the study.

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Unsafe acts or behaviors have been identified as one of the major contributing factors to work related incidents. OSHA claims that Behavior based safety programs have been described by OSHA as an attempt to shift the responsibility for a safe workplace totally to the employees, thereby preventing the management from investigating workplace related hazards which are often the incident's root causes. In an attempt to improve the working environment, several researchers have suggested the creation of a safety culture which enables management to develop hazard-free workplace [2]. Statistical study using a regression based model has been found in literature to relate incident rates and intervention factors [3,4]. The model was used to compare the prior incident rates to the collected data. But a major drawback of the model is the assumption of the entire safety program as a single intervention. As a result of this assumption, no interactions could be made for a single intervention.In some cases, government and regulatory authority imposes some additional obligation to ensure hazard free workplace [5,6]. Various efforts had been taken to improve safety culture in any organization [7].

Statistical studies have shown that a safety program is made up of several intervention activities. Some of the researchers have investigated the effectiveness of safety management policies and teamwork [8]. The survey showed that good communications skills could improve safety management policies, but quantitative analysis of the improvement was neglected. Most of the results of behavioral surveys are based on human perceptions which may not be a true representation of the required intervention program. Perception surveys are useful in complementing safety and health programs but cannot be used as measure of effectiveness. There was a perception survey on four pairs of matched firms based on the relationships between employee perceptions of management behaviors, actions and safety outcomes [9]. The study utilized the Minnesota Perception Survey for the collection of data. The Minnesota Perception Survey, which initiated in 1976 to analyze the safety of the United States railroad industry, was based on the need to understand the major weaknesses of safety programs.

A model was developed to predict incident costs by incorporating multiple factors such as the quality of the protective equipment utilized by their employees, the frequency of training programs adopted by the organization, and the frequency of motivational incentives provided [10]. Although the developed model shows that incident costs decrease over time, the research lacked sufficient data to adequately show the correlation or mathematical relationship between the predicted man-hours and the incident frequency. In an effort to determine the relationship between incident rate and the total man-hours allocated, the National Institute for Occupational Safety and Health (NIOSH) conducted a study which argued that increasing the level of man-hour allocation tends to reduce incident rate. The study showed that a decline in incident rate is based on the level of the application of safety intervention (NIOSH, 1999). Some researchers argued that at some point, an additional allocation of man hour will no longer necessarily impact incident rate reduction in a substantial manner [11].

This study, therefore goes a step further in identifying the region in which any additional allocation of man-hours will no longer provide a realistic justification for continuous allocation of resources. It should be noted that additional application of resources in an effort to further minimize incident rate beyond the "optimum region" will lead to an unnecessary increase in safety costs. Although, most companies may be willing to allocate huge resources and capital towards achieving incident rates of zero, it may be highly impossible to achieve this objective in reality.

2. Evaluation of Safety Intervention Model

Chevron is one of the world's leading integrated energy companies producing safe, reliable energy now and for the future. Through its subsidiaries in Bangladesh, Chevron produces natural gas and condensate from three fields in the northeast of the country. Chevron Bangladesh has achieved a remarkable safety record while employing more than 2,000 Bangladeshis. They achieved their safety records by adopting safety interventions shown in Table 1.

A rigorous survey has been conducted in order to know the effectiveness of each of the safety interventions at Chevron Bangladesh. 10 safety experts have been carefully selected from Chevron Bangladesh. Based on the experts' opinion, regarding effectiveness of implemented safety interventions, following Pareto chart has been developed shown in Fig. 1. Experts' opinion has been converted into quantitative data with a scale of 0-200 marking.

From Fig. 1, it is considered that top five safety interventions are mainly responsible for safety issues at Chevron Bangladesh. These five prominent safety interventions are Leadership and Accountability, Qualification Selection and Pre-Job, Employee Engagement and Planning, Work in Progress, and Evaluation, Measurement and Verifica-