SAFEY RISK ANALYSIS AND RISK MANAGEMENT IN MINES

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Abstract

Safety risk assessment is sine quo non for ensuring mine and miners safe. This paper highlights in brief the different qualitative, quantitative and hybrid techniques for risk assessment in mines. It also highlights the different risk management options to make mine working safe so that fatalities and injuries to the miners are brought to the minimum and the goal of ZAP/MAP can be realized in Indian mines.

1. INTRODUCTION

Risk has been considered as the chance that someone or something will be harmed or experience an adverse health effect if exposed to the hazard and the consequences of human activities on systems with hazardous characteristics and constitutes a needful tool for the safety policy of a company.

2. MINING INDUSTRY RISK MANAGEMENT

Risk management systems have been used in many industries to manage inherent hazards in their business. In fact, some countries mandate risk management approaches in their minerals industries and produce technically detailed regulations, often reacting to a particular disaster, with the purpose of prescribing specific industry actions. By evaluating these different approaches to risk management, an assessment can be made of the impact of the risk management framework on miner injuries .

2.1. The US Experience

The reoccurrence of multiple fatality events in the US Minerals Industry supports the need for improvements in the way major hazards are identified, assessed and managed. Many solutions to reduce mining disasters have been proposed including additional regulations, improved training, more reliable equipment, and better technology. In December of 2006, the National Mining Association's Mine Safety Technology and Training Commission stated that a new paradigm for ensuring safety in underground mines was needed.

2.2. The Australian Experience

Australia helped pioneer the concept of a Risk Management Standard, with the development of the original Australia Standard for Risk Management -AS4360. The effectiveness and success of this standard led to it becoming the foundation for a new International Standard for Risk Management, developed by the International Organisation for Standardisation (ISO).

2.3. The Minerals Industry Safety and Health Centre (MISHC)

To assist in evaluating the Major Hazard Risk Assessment (MHRA) approach, National Institute for Occupational Safety and Health (NIOSH), USA sought help from a leading Australian institution involved in implementing mineral industry risk management programs.

2.4. The Indian Experience

The effectiveness of the safety professionals in the mining industry and the enforcement organization, i.e. DGMS is, to a great extent, dependent on the capability and competence of its front-line officers who come in frequent contact with various segments of the mining community. Amazing advancements have taken place in the Indian mining industry during the past few decades. Recourse has been taken to intensive mechanization to meet high targets of mineral production. Both, on

account of the increased complexities of safety and tremendous expansion of mining activities, the responsibilities of DGMS in drafting/developing matching safety legislation, standards and codes of practice; in scrutinizing and approving working plans and granting permissions & exemptions; in analysing the hazards associated with introduction of new machine or equipment; in monitoring and promoting compliance.

3. RISK ANALYSIS AND ASSESSMENT TECHNIQUES

3.1. Qualitative Techniques

A. ***Checklists***

B. ***Safety Audits***

C. ***Task Analysis (TA)***

3.2. Quantitative Techniques

D. ***The proportional risk-assessment (PRAT) technique:***

This technique uses a proportional formula for calculating the quantified risk due to hazard. The risk is calculated considering the potential consequences of an accident, the exposure factor and the probability factor.

R = P*S*F

Where, R: the Risk;

P: the Probability Factor;

S: the Severity of Harm Factor;

F: the Frequency (or the Exposure) Factor

Hybrid Techniques

E. ***Fault-tree analysis (FTA):***

It is a deductive technique focusing on one particular accident event and providing a method for determining causes of that event. In other words FTA is an analysis technique that visually models how logical relationships between equipment failures, human errors, and external events can combine to cause specific accidents.

4. SAFETY RISK MANAGEMENT

A Safety Management System (SMS) consists of comprehensive sets of policies, procedures and practices designed to ensure that barriers to unwanted incidents are in place, in use and are effective.

4.1 Characteristics of Safety Management Systems

The major characteristics of SMS are:

- It is the principal vehicle for day to day management of all aspects of safety in the operations.
- Its focus is not only on personnel safety, but also ensuring operational integrity and
- It lists a set of performance indicators to monitor the integrity of the safety critical activities being undertaken correctly and according to schedule.
- It outlines an auditing and feedback regime for management control of hazards. It should be recognized that without a formal well-defined SMS, followed by adequate training, implementation and monitoring, major hazards are impossible to manage of a PE system.

5. CONCLUSION

Safety and environmental risk assessment is sine quo non for ensuring mine and miners safe .It is necessary to assess the risk from different mining operations and take cost effective suitable measures to prevent, eliminate and minimize risk. Both qualitative and quantitative risk approaches can is followed to assess the risk level. Risk analysis techniques like FTA, ETA and HAZOP etc can be used as tools as study and understanding the risk levels more effectively and can aid in risk prevention and control[35].

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