ENSURING HEALTH AND SAFETY IN CEMENT MANUFACTURING INDUSTRY

S.Pradeep #, M.Sathyanathan*

PG Scholar, Department of Mechanical Engineering, Knowledge Institute Of Technology, Tamilnadu

* Associate Professor, Department of Mechanical Engineering, Knowledge Institute Of Technology, Tamilnadu

***Abstract* — The Cement manufacturing process mainly can be divided in to ten stages. There are numerous hazards which may cause harm to human and environment from limestone quarrying to final cement production and dispatching. The purpose of this project to reduce the hazards and its risk by implementing hazard identification and Risk assessment techniques and methods and to provide adequate control measure and provide safe workplace to humans and improve the health of the workers and reduce impact on environment. Hazard was properly identified, analysis and assess qualitative and quantitative methods of risk evaluation and risk estimation can be done. Hazards in the cement manufacturing process can be controlled by proper recording documenting and review the hazards at the regular intervals.**

Keywords: Hazard identification, risk assessment, cement industry.

I. INTRODUCTION

A. Description

Workplace health and safety is ensured when persons are free form
(a) Death, injury, or illness caused by any workplace, relevant workplace area, work activities, or plant or substances for use at a relevant place; and

(b) Risk of death, injury or illness created by any workplace, relevant workplace area, work activities, or plant or substances for use at a relevant place.

B. Health

Occupational health is branch which focuses on work related health issues on the human and its impacts.
Occupational Health includes all factors relating to work and working conditions, methods and environment that may cause diseases, injuries or deviation from health including maladjustment to work. Occupational health not only focuses on health protection but also promoting the health improvement and wok ability of the workers by providing preventing measures against diseases, psychological factors , nutrition etc.

Occupational health was defined by ILO/WHO committee in 1950 as "occupational health should aim at: the promotion and maintenance of the highest degree of physical, mental and social wellbeing in all occupations, the prevention among the workers of departures from health caused by their working conditions, the protection of workers in their employment from risks resulting from factors adverse to health, placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological ability and to summaries: the adoption of work to man and of each man to his job"
It include medical examinations of workers, their health record, placement according to health condition and adjusting work to man and man to his work.

C. Safety

Whilst it is true that no human activity is entirely devoid of risk, it is also true that there is, in theory at least, a safe way of performing every operation. The aim of this project is to explain both the underlying principles and the practical measures that the company have adopted to maximize safety - i.e., to reduce the level of accidents and mishaps to as near zero as possible.

The concept of safety is linked to that of an unattainably ideal situation in which every system is functioning perfectly and everything is in its place. In real life this happens rarely, if at all: Precision component is variable; equipment deteriorates and needs maintenance, whether planned or unplanned; operators fall sick, grow tired, become forgetful; a snowstorm delays essential supplies. Although this is not the whole story, it is certainly true that safety is enhanced by normal operation, smooth running, and general tidiness. It is also enhanced by good personal contacts and happy working relationships in which people are not, for example, tempted to cut corners in order to meet over-demanding schedules or to convince their superiors that they are doing a proper job.

II. METHODOLOGY

The following methodology has been implemented

1. Observing the existing health and safety system in the plant
2. Collecting data from the past accidents records and analyzing for last five-month incidences.
3. Identify the hazards department wise.
4. Accessing the risk.
5. Evaluation existing risk controls
6. Suggesting control measures for the hazard
7. Bringing out observations and recommendations.
8. Implementation and monitoring

The risk assessment procedure can best be illustrated in the following way.

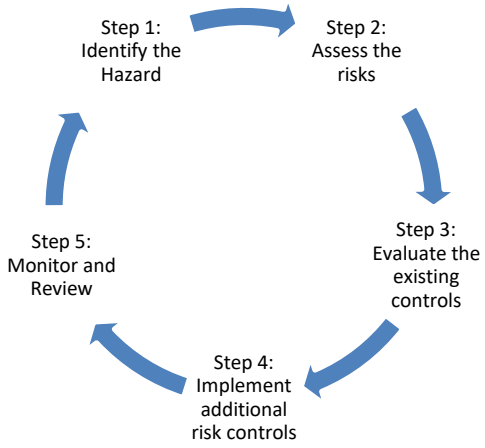

Fig 1. Risk Assessment Procedure

		Rating	*Injury*
Slightly harmful	(SH)	1	Minor Injury / First aid
Harmful	(H)	2	Hospitalization / Off site treatment
Extremely Harmful	(EH)	3	Permanent Disability / Fatality

1. Rating of Hazards.

All activities are examined for hazards and corresponding risks based on the severity rating and probability rating.

Risk Score = Probability x Severity

A. Severity Rating :

Table:1 Severity Rating

B. Probability Rating :

		Rating	Probability
Highly unlikely	(HU)	1	Occasionally / Very Rare (More than five years)
Unlikely	(U)	2	Rare (More than one year)
Likely	(L)	3	Sometimes (Once in less than 6 months)

Table:2 Probability Rating

C. Risk Rating

		Risk Severity Ratings(S)		
		Slightly harmful (SH) 1	Harmful (H) 2	Extremely Harmful (EH) 3
Risk probability Ratings(P)	Highly unlikely (HU) 1	Trivial (1)	Tolerable (2)	Moderate (3)
	Unlikely (U) 2	Tolerable (2)	Moderate (4)	Substantial (6)
	Likely (L) 3	Moderate (3)	Substantial (6)	Intolerable (9)

Table 3. Risk Rating

2.Significance Hazards

Acceptability or Non acceptability of hazards is identified as follows.

1. All hazards having risk level Substantial and above i.e. risk level as 6 and 9 are considered as non-acceptable.
2. Other hazards with Moderate, Tolerable or Trivial risk rating i.e. risk levels 1 to 4 are considered as acceptable hazards.

Hazard identification and risk assessment in the workplace should be done and necessary control measures to be provided before it causes harm to humans , property, and environment.

All hazards that have been assessed should be dealt with in order of priority in one or more of the following hierarchy of controls

1. Hazard Elimination: remove it from the workplace
2. Substitution – Hazard to be controlled by substituting the another substance/job/place.
3. Isolate or enclose the hazard: separate the hazard from the workplace.
4. Use engineering solutions: modify existing machinery or plant or purchase different machinery or plant.
5. Administrative Procedures: develop work methods to reduce the conditions of risk, eg:
   a. Written Safe Operating Procedures
   b. High hazard job to be provided with time restricted shifts.

c. Staff trained in the correct operating procedures.

6. Use Personal Protective Equipment (PPE) and training in its use: this should only be used as a last resort to deal with the hazard, where the hazard cannot be removed or reduced by any other means, eg:
   a. Proper PPE's should be used while handling the chemicals
   b. Protecting eyes from flying particles.
   c. Protecting feet – safety boots.

All the hazards and its control measures to be assigned to the designated employee and target date must be provided and it should meet all the safety requirements once completed.

III. RESULTS AND DISCUSSIONS

The following hazard were identified, and control measures were provided.

1. While Unloading and loading of hazardous Waste , there was a possibilities of inhalation fumes and vapours. It may cause health hazard to be person engaged to work. Proper PPE'S and training should be provided to employees. Risk Score –R =3 x 3 =9 (High risk) , After control measures R = 1 x 1 = 1 (low risk)
2. Gas cylinders loading / Unloading may cause fire hazard without the spark arrestors. Spark arrestors and MSDS to be ensured before engaging to work.
3. Loading and unloading area platform accumulated with huge cement dust . It may cause trip hazard. Platform cleaning frequency to be increased.
4. Work inside the clinker causing high heat hazard to the workmen engaged. Safe work procedures(SWP) to be implemented and work permit to be verified.
5. SWP to be implemented for the cooking gas cylinders in the canteen. Improper handling may cause fire hazard.
6. Air Borne dust causing the health hazard. Vacuum cleaner to be used and Adequate control measures to be implemented. FFP1 or FFP2 pollution control mask to be used.
7. Quality checking of the cement causing risk score level high because testing the sample by using acids. Also collecting of samples at high temperature may cause heat hazard, heat resistance and acid resistance PPE's to collecting and testing the samples.
8. Fall of materials around the around the conveyor while feeding the limestone in the kiln. Fencing should be provided around the conveyor. Signage boards to be provided near the conveyor.
9. Full Body harness using for the height work has no shock absorber. Full body harness with shocker absorber will provide additional to be workmen engaged in the height work.

Recommendations.

1. Risk assessment to be done and find the acceptable level of risk by conducting hazard identification and risk assessment technique. Immediate action to be taken if risk is not acceptable. Adequate control measure to be implemented and monitored to minimize the risk to acceptable level.
2. To minimize the risks identified , risk control effectiveness should be monitored, re- evaluated, and check compliance with decisions.
3. Adequate control measure is necessary for implementing risk evaluation decisions.
4. Risk assessment should be periodically reviewed at least once in a year
5. Major prone areas to be identified and risk to be minimized to the acceptable level by frequently conducting risk assessment.

IV. CONCLUSION

The various hazards which associated with different works are identified and determination of control is provided to eliminate or to bring the risk under the acceptance level by implementing hazard identification and risk assessment technique.

It was found that most of the hazards occurred are due to improper working methods followed by workers. Safety training and safety policy are essential determinants to enhance health and safety performance. Health and safety standards and goals, and health and safety management, which include personal involvement, communication, workplace hazards and physical work environment as factors that enhance health and safety activities in cement manufacturing industry.

Health and safety in cement manufacturing industry can be ensured by taking safety programs to eliminate the existing hazard or bring the risk under acceptable limit and implementing hazard identification and risk assessment technique to identify new hazards. It is a continuous process of risk assessment.

REFRENCES

1. Syed Sana Mehraj1, G.A. Bhat1, Henah Mehraj Balkhi2, "Cement factories and human health", Int J Cur Res Rev, Sept. 2013/ Vol 05 (18).
2. Manish Kumar1, "Risk Assessment in Cement Manufacturing Process", Vol. 8 Issue 04, April-2019. International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181
3. S. Khaviya1, S. Kavitha2, S. Manoj3, "A Risk Assessment Study on Occupational Hazards in Cement Industry", Volume: 04 Issue: 12 | Dec-2017.
4. Selçuk Çankaya1, Simge Çankaya2, "Occupational health and safety in cement industry", ISSN 1314-7234, Volume 9, 2015.
5. Zhang Canfenga, Yuan Shujiea,b,*, Li Dong,

"Comprehensive Control of the Noise Occupational Hazard in Cement Plant", Procedia Engineering 43 (2012) 186 – 190.

6. Meenesh Kumari Tomar, "Study of Occupational Health, Safety and Environmental Aspects in Major Cement Manufacturing Industry (Ultratech Cement Limited.)" Journal of Environment and Earth Science, ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online) Vol.4, No.9, 2014.
7. Vedat KARAHAN, Cevdet AKOSMAN*, "Occupational Health Risk Analysis and Assessment in Cement Production Processes", Turkish Journal of Science & Technology Volume 13(2), 29-37, 2018.
8. Saiyed HN, RR Tiwari, "Occupational Health Research in India", Industrial Health NIOH Statistics on Silicosis, 2004, 42:141–8.,
9. Cement industry in India: India Brand Equity Foundation, February 2014, http://www.ibef.org/industry/cement-india.aspx.
10. T Mounia, C Rachid, C Yahyia, "Promoting a culture of health and safety at work in cement plants." International Journal Of Computational Engineering Research (ijceronline.com) Vol. 2 Issue. 8.
11. Health and safety in the cement industry: Examples of good practice, Cement Sustainability Initiative (CSI), December 2004.
12. L. G Burange, S Yamini, "Performance of Indian cement industry: the competitive landscape". University of Mumbai, Working paper ude(cas)25/ (9)/3/2008, April 2008
13. [6] Mwaiselage J, Moen B, Bratveit M. "Acute respiratory health effects among cement factory workers in Tanzania: An evaluation of a simple health surveillance tool". Int Arch Occup Environ Health 2006; 79:49-56.
14. Yang CY, Huang CC, Chiu HF, Chiu JF, Lan SJ, and Ko YC. Effects of Occupational dust exposure on the respiratory health of Portland cement workers. J.Taxicol. Environ. Health.1996; 49: 581-588.
15. Bazas, T. Effects of occupational exposure to dust on the respiratory system of cement workers. J. Soc. Occup. Med. 1980; 30: 31-36.