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Risk Assessment in Cement Manufacturing Process

Manish Kumar[1],
[1] ME Scholar ,
Dept. of Mechanical Engg.,
Bhilai Institute of Technology,Raipur,
CG, India

Manish Kumar Mishra[2]
[2] Assistant professor,
Dept. of Mechanical Engg.,
Bhilai Institute of Technology,Raipur,
CG, India

***Abstract*:- Cement is the basic material used for construction activities. The Cement manufacturing process mainly can be divided in to ten stages. From limestone loading to dispatching of cement various hazards takes place which causes harm. The purpose of this project to minimize the risk by using Risk assessment techniques and methods and provide safety control measures, health and safety environment built up and healthy environment create beneficial for human activities. Hazard was properly identify, analysis and assess qualitative and quantitative methods of risk evaluation and risk estimation can be done. Proper recording, documentation process and review from time to time to proper control the cement manufacturing activities.**

KeyWords: Identification of hazards, estimation of hazards, evaluate the hazards, Records and findings, safety control measures, Risk assessment techniques.

1. INTRODUCTION OF RISK ASSESSMENT

Risk assessment is a techniques to properly assess the risks. It is simply a careful examination of the work place to prevent any harm.You have enough precautions to prevent any harm coming to the workers. The aim of risk assessment if no one can injured at the workplace.Accident and ill health at work place of the workers, which affects our business and output is lost.In some countries you are legally required to assess the risks in workplace

2. LITERATURE REVIEW

Alvear- Galindo, Mendez- Ramirez, suggest that when working in cement industry, industrial workers are prone from hazards. Various stages of manufacturing process every stages hazards related personal protective equipments, unsafe condition for doing work. Workers are exposed to hazards in their workplaces affects the health [1]

R. Hamdy, suggest that Hazard faced in each and every stage mining, crushing, stacking and reclaiming, grinding, calcination stage, cooling, material, storage and transportation system. In that production process high risk and hazard created affects industrial workers. Hazard faced in our working environment is noise dust, vibration and emergency response to highlight the impact of changing environment pattern on the level and growth of productivity and efficiency in the industry[2]

Ishak, S. and Hashim, explained that Moreover health safety policy statement should contain its aim. These following points considered safety policy.

1) Safety precautions can be taken from time to time.
2) Personal protective equipment is necessary each and every stage at production process.
3) Standard operating procedure is maintained.
4) Health and safety program conducted.
5) Supervision, training program conducted, risk assessment, information gather these are the basic requirements of health and safety.
6) To use a safety committee.
7) Safety welfare program be conducted, the aims should cover health and safety and environmental issues.[3]

Jousi A., Risk engineering is an important role in cement manufacturing process to eliminate the hazards, examine the performance, to analysis the losses, identify the hazards, providing recommendation, proper record keeping maintained (previous records), Risk engineering. Control all the tasks such as guarding information, behavior of works to mining the risk and provide safety measures.[4]

Bartolozi, L. Castiglione, explains that Continuous improvement day by day to increase the efficiency, In cement manufacturing process to eliminate all wastages. In cement manufacturing process raising etc. quality of product, the cost should be minimize, improving delivery of product, reducing wastages.

Implementation of cement industry day by day to increase the productivity beneficial for our future. New technique be developed to proper control cement manufacturing process. To proper continuous improvement of production process. Input, output and process control management.[5]

Lesliam suggest that to control risk in cement manufacturing plant our working operation should be safe and reliable without any disturbance. Risk evaluation is access any from time to time to provide safety and beneficial for future development our work should be safe and reliable and easily handling of manufacturing process by using simple techniques and easy procedure maintained to provide proper satisfaction.[6]

Occupation health and safety point of view, in the cement plant health and safety environment created to provide proper satisfaction among the workers.

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Winston, H.H and D. Joan suggest that In cement industry pollution prevention is necessary to provide safe and healthy environment built up. To control cement manufacturing process pollution free system should be developed and various safety precautions and guidelines conducted.[7]

3. PROCESS INVOLVED

Cement manufacturing Process divided in mainly in 10 stages:-

1. Mining.
2. Crushing.
3. Stacking and reclaiming.
4. Grinding in V.R.M.
5. Preheating in pre-heater.
6. Burning in kiln.
7. Cooling in cooler.
8. Grinding clinker with gypsum and fly ash.
9. Packing in packers.
10. Dispatch products

Methods :-

1. Risk identification.
2. Consequence analysis.
3. Quantitative, quantitative probability estimation.
4. Assessing the effectiveness.
5. Estimation the level of risk.
6. Risk evaluation.

Using following techniques for my current project work:-
Major prone areas such as kiln heating, conveyor belt – raw material movement, dust and suspended particle, material sampling. This technique can be used in my project work.

1. Brainstorming- Generate new ideas and solutions (supervisors, workers etc)
2. Checklists – Documentation of the task
3. Hazard and operability study – proper evaluation, control measures
4. Failure mode and effect analysis- qualitative and quantitative methods used.
5. Fault tree analysis- Identify potential causes of system failures.
6. Preliminary Hazard Analysis- Identifying apparent hazards, assess the severity.
7. Swift if technique- corrective action created and standard operating procedure.
8. Toxicity assessment- Is the process of evaluating whether the possibility exists.

3.1 Types of risk

Likelihood	Low	**Risk Low**
Consequence	Low	
Likelihood	High	**Risk Medium**
Consequence	Low	
Likelihood	Low	**Risk Medium**
Consequence	High	
Likelihood	High	**Risk High**
Consequence	High	

There are five step to conduct risk assessment which are as follows :-

1. List the work task
   (a) Location (location change – risk is change)
   (b) People (Worker unexperienced, not competent)
   (c) Work activity (Different work has different risk)
   (d) Equipment (ladder, scaffold, machinery etc.)
2. Identify the risk
   (a) What are the hazards? (fall of man)
   (b) Who might be harmed? (Workers, visitors, engineer, manufacturer, supervisor).
   (c) How might they be harmed? (due to lack of safety harness- worker may fall)
3. Estimate the risk
   The below figure shows the estimation of risk.

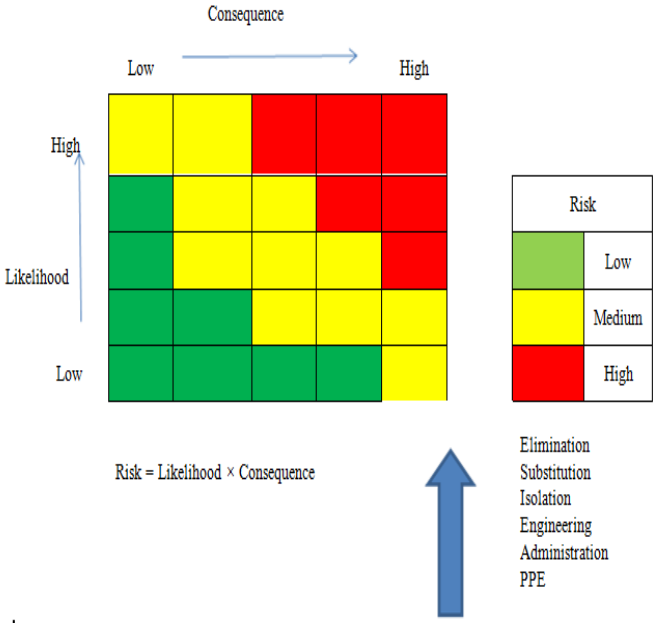

Figure 1 : Estimation of risk

You need to consider two things:-

(a) How likely is it that something could go wrong? (likelihood- possibility of risk)
(b) How serious would the outcome be?

Risk = likelihood × consequence

4. Evaluate the risk
   Likelihood
   5- Very likely
   4- Likely
   3- Fairly likely
   2- Unlikely
   1- Very unlikely
   Consequences
   5- catastrophic (death)
   4- major (big outcome)
   3- moderate
   2- minor
   1- insignificant

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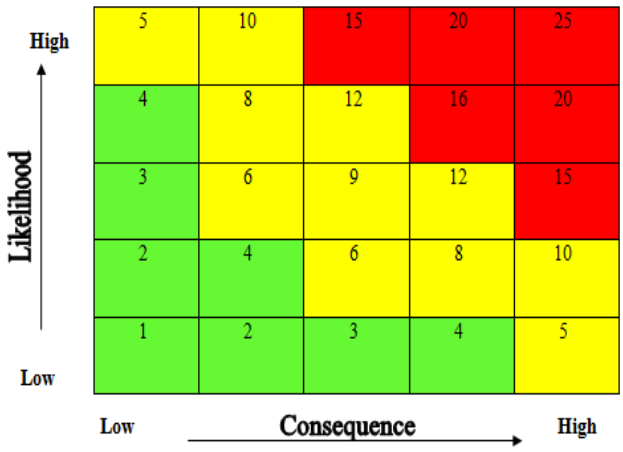

Figure 2 : Evaluating risk

1-4 Low risk (acceptable)
5-14 Medium risk (tolerable for little work)
15-25 High risk (Take immediate action)

5. Record your findings
   (a) The location, activity and equipment
   (b) Being assessed
   (c) Hazard and risk levels (evaluation)
   (d) Risk controls
   (e) Assessor's details
   (f) Date and time
   (g) Review date (1 year, worker change, location change, equipment change review is necessary not wait for the year)

Calculation :-

Risk = L × C

Risk Rating = N × L × C

Where,

N = Number of workers,

L = Likelihood,

C = Consequence

4. VARIOUS HAZARDS

Hazard faced in cement manufacturing process:- Various hazards take place are as follows:-

1. Exposure to dust – Transferring of material as well as storage of material excessive dust create major problems.
2. Unclean platform – To do work in presence of unclean surfaces high risk should be created.
3. Poor supervision – Travelling over and under the transportation system.
4. Electrical hazards – Electrical parts such as cables, some time shocks and vibration possibility.
5. Exposure to noise – In crushing operation excessive noise created.
6. Falling of material – Falling of material at certain height.
7. Hurling of mill parts – From the mill platform high risk built up.
8. Kiln thermal load hazards – Thermal disturbance which affects the surface property.
9. Use of manual work equipment – Handling of material not be proper by poor operating condition of equipments.
10. Work in confined space – Interior work on the basis of clinker production system.
11. Untrained drivers – Drivers are not properly trained they are carelessly in driving position.
12. Inadequate brakes – lack of maintenance possibility.
13. Hit by fly rocks – Bodily injuring during blast operations.
14. Storage of explosive – Exposure to over pressure.
15. Noise and vibration – During drilling operations noisy and vibrating surfaces affects the production processes.
16. Boulder accidents – During blasting operation, Fly rocks and boulder accidents.
17. Accidental fire – Some time fire accident in the transportation of materials.
18. Conveyor hazards – conveyor moving parts contact with people.
19. Mechanical hazards – Mechanical equipment failure.
20. Use of lifting – Lifting equipments have high risk from loading of materials.

4. RESULT

1. To determine the acceptable level of risk by using risk assessment techniques and methods and provide safety control measures. High risks range (15- 25) , to reduce this risk to take immediate action is required using safety control measures. Risks should be minimized as an acceptable level to manage it (1-4).
2. To minimize the risks, risk control can involve monitoring, re- evaluation, and compliance with decisions.
3. Proper action is necessary to implementing risk evaluation decisions at time to time.
4. It is good practice to review assessment for particular time to time (1 years) to be done. The level of documentation on the basis of legislated requirements.
5. To minimize major prone areas risk by using five basic steps to conduct risk assessment and provide safety measures.

Air borne dust :- R= L × C = 3×3 = 9 (Medium Risk).
To minimize this risk control measures apply such as PPE, Dust suction system etc. So R= 1 ×1= 1, this type of protective measures activities the overall risk is to be reduced. Similarly other prone hazards area of high risks is minimized by using risks assessment techniques and methods to provide control measures.

5. CONCLUSION

In this project we study about cement manufacturing process & identification of hazards at each and every stages of cement manufacturing process. major prone areas working that part using risk assessment techniques and methods to minimize the risks and control measures.

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6. FUTURE SCOPE

Furthermore, the research push the management to adopt best practices to remove the waste of the overall process.
The application will be extended to different cement companies taking in consideration the impact of maintenance practices on productivity .In addition, it will consider establishing a reference guideline of a standard procedure based on the process of maintenance protocol development for cement companies.

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