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HAZARD IDENTIFICATION AND MITIGATION MEASURES IN MINI STEEL PLANT

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Abstract

Industrial process and activities inherently pose hazards. There may be possible hazards to human beings, flora-fauna, all forms of property and the environment as a whole. Extreme care is essential in handling all of them in various stages of manufacturing. Vital element of industrial health and safety policy and implementation plan is the identification, evaluation, elimination and / or the control of hazards in the shop floor and place of work. Elimination of all hazards and its source is not possible; hence, the target is to eliminate and control the critical hazards with their emerging potential and to protect the interest of employees in the world of work. It is essential to minimize the other associated hazards to the lowest logical level to meet out the health and safety objectives of the organization. In Mini Steel Plant such as Induction Furnace and Rolling Mill Units, due to its complex nature of the operation, systems, procedures and methods it always involves some amount of hazards. To improve the productivity of operation and labor it is essential to have a time bound risk assessment plan and technique. This paper deals in the study of Hazards identification and Mitigation Measures
Keywords: Hazards, Risk, Hazards Identification, Mitigation Measures

I. INTRODUCTION

Aiming at the safety first- it's a vital for the steel making industry to create a priority based environmental plan which is congenial and focused towards safety awareness in workplace, as steel melting and rerolling embraces hazards in each process activities. Industry becomes successful by not only meeting the production requirements but also should have high employee satisfaction by providing the safety requirements in the workplace. It is impossible to predict exactly when hazards will occur or the extent to which they will affect communities within the Work Area. However, with careful planning and collaboration, it is possible to minimize losses that can result from hazards. Mitigation of hazards adheres to appropriation of action taken, so as to minimize the loss of life as well as fixed assets by attenuating the impact of disasters. It is often considered the first of the four phases of emergency management; mitigation, preparedness, response and recovery. Characterizing the hazards involves determining hazards' causes and characteristics, documenting historic impacts, and identifying future probabilities of hazards

occurring from Occupational Safety Hazards to process to work environment Hazards.

II. LITERATURE REVIEW

The word hazard, meaning 'a danger or risk' is taken from Old French "hazard", although the origin of the French word is uncertain. It is potentially of Arabic origin as the same name was given to a dice game allegedly invented during the siege of a castle called Hasart or Asart in Palestine, and thus named after it (Oxford Dictionary, 2017). The International Labour Organization (ILO) defined a hazard as "The inherent potential to cause injury or damage to people's health."

According to Health and Safety Organization (2017), 'Hazard is a potential source of harm or adverse health effect on a person or persons' and when we refer to risk in relation to occupational safety and health the most commonly used definition is 'risk is the likelihood that a person may be harmed or suffers adverse health effects if exposed to a hazard.'

Risk is defined by Collins Concise Dictionary & Thesaurus (2006) as "the possibility of bringing about misfortune or loss" which also bear the same meaning as "danger, hazard, pitfall, peril and Uncertainty". Taking this definition into economic perspective, risk is future uncertainty which need to be managed in order to avoid variety of consequences ranging from negative surprises to permanent loss.

The terms Hazard and Risk are often used interchangeably; the difference between the two could be seen with illustration –"if there was a spill of water in a room then that water would present a slipping hazard to persons passing through it. If access to that area was prevented by a physical barrier then the hazard would remain though the risk would be minimized."

Section 41C of Factories Act, 1948 quotes Specific responsibility of the occupier in relation to hazardous processes as "Every occupier of a factory involving any hazardous process shall-

(a) maintain accurate and up-to-date health records or, as the case may be, medical records, of the workers in the factory who are exposed to any chemical, toxic or any other harmful substances which are manufactured, stored, handled or transported and such records shall be accessible to the workers subject to such conditions as may be prescribed;

(b) appoint persons who possess qualifications and experience in handling hazardous substances and are competent to supervise such handling within the factory and to provide at the working place all the necessary facilities for protecting the workers in the manner prescribed;

(c) provide for medical examination of every worker-

(i) before such worker is assigned to a job involving the handling of, or working with, a hazardous substance, and

(ii) while continuing in such job, and after he has ceased to work in such job, at intervals not exceeding twelve months in such manner as may be prescribed."

The choice and the implementation of specific measures for preventing Hazards and workplace injury and ill health in the workforce of the iron and steel industry depend on the recognition of the principal hazards, and the anticipated injuries and diseases, ill health and incidents.

Most common causes of injury and illness in the iron and steel industry are : Slips, trips and falls on the same level; Falls from height; Unguarded machinery; Falling objects; Engulfment; Working in confined spaces; Moving machinery, on-site transport, forklifts and cranes; Exposure to controlled and uncontrolled energy sources; Exposure to asbestos; Exposure to mineral wools and

fibres; Inhalable agents (gases, vapours, dusts and fumes); Skin contact with chemicals (irritants (acids, alkalis), solvents and sensitizers); Contact with hot metal; Fire and explosion; Extreme temperatures etc (ILO, 2005).

III. OBJECTIVE OF THE STUDY

The main objective of this study is to identify the source of hazards, potential risks associated with it and disclosure of the mitigation measures. The focus of the study revolves around determination of damage due to major hazards having damage potential to life and property and provides a scientific basis to assess safety level of the facility. The secondary objective is to identify major risk in manufacturing process, operation, occupations and provide control or mitigating measures and also to prepare general guidelines for the on-site, off site plans to control hazards.

IV. HAZARD IDENTIFICATION

The Hazard Identification process is to identify hazards that could cause a potential major accident for the full range of operational modes, including normal operations, start-up, and shutdown, and also potential upset, emergency or abnormal conditions. Hazard Identification should be a continual process in line with the introduction of new operations or any changes in the process activities or product mix.

Hazard Identification requires the employer, in consultation with the employees, to identify all reasonably predictable hazards which have the potential to cause Likelihood, Severity and Consequences of the accident or incident. In nut shell, it includes examining each location including the work area and other free space as norms, production process, storage of intermediates and raw material and final product for the purpose of identifying all hazards which are "inherent to the job".

Work areas include but are not limited to machine workshops, Quality Control Laboratories, Office Areas, Plantation and green belt, Effluent Treatment, Stores, waste storage, Trans boundary movement of waste, transport and maintenance.

V. HAZARD IDENTIFICATION AND PREVENTIVE MEASURES

As, it is defined as the process of assessing the risks associated with each of the hazards identified so that appropriate control measures can be implemented based on the probability, i.e. likelihood that harm, injury or ill health may occur and how severe the consequences of exposure might be. This study is confined to some of the crucial areas of Hazards in Mini steel Plant, where Induction Furnace with continuous casting and Rolling mill is in operation, as below:

1. Occupational and Safety Hazards and Preventive Measures
2. Process Hazards and Preventive Measures
3. Storage Hazards and Preventive Measures
4. Ergonomics & Manual Handling Hazards and Preventive measures
5. Work Environment Hazards and Preventive measures

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Table 1: Occupational and Safety Hazards and Preventive Measures

Sr. No.	Type of hazard	Sources	Risk	Mitigation measures
1.1	Noise	Blower, ID Fan, Compressors, D.G Set, IF melting process, fuel burners, Scrap and product handling, Rotating equipment, Furnace Charging, Rolling mill.	Hearing Impairment interference in communication fatigue.	Audiometric examination, Noise monitoring, Issue of PPE, like ear plug, muff isolation, substitution and engineering control installation of acoustical booth, rotation of workers and minimize the time enclose fans, insulate ventilation pipes, cover and enclose scarp and storage and handling area adopting slag practice in IF.
1.2	Vibration	Manufacturing process	Whole body vibration hand transmitted vibration	High risk tools and Machinery Must be eliminated or provided with anti-vibration handle or vibration isolation.
1.3	Heat Stress	Process of rolling, Induction furnace (Molten metal and hot surfaces), Ladle/ Tundish/ CCM	High temperature Humidity	Clothing against the hazardous substance, rotation of job or worker, cold drinking water, salt to worker, safety distance of 4 mtr from the delivery spout are suggest to work near molten metal.
1.4	Radiation	Scarp, testing of equipment	Fatal disease	Scarp must be free from Contamination. Face mask / shield should be provided.
1.5	Inhalation agent (Gas, vapour, dust, fumes)	Metallic duct, IF raw material storage, melting process.	Damage pulmonary	Good ventilation system must be provided. Isolation of process, substitution of raw material workplace monitoring should be carried out, provide separated eating facilities and washing before eating provide sealed cabin with filtered air conditioning use of filter respirators when exposed to heavy dust co- analyses and detective equipment should be instated to alert control rooms and local personnel.
1.6	Confined space	Fuel tank bunker	Fatalities	PPE should be provided Follow the work permit system.

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1.7	Electrical	IF, Motors, Panels, Sub Station; Electrically operated equipments	Burn	Proper earthling must be carried out. Use of
1.8	Explosion	Molten metal, Contaminate Scrap handling yard, CCM	Burn, injury, Death	Complete dryness of Material prior to contact with liquid iron and steel separation of flammable gas and combustible material, ensure that scrap used in process should not be contaminated with hazardous materials. Storage structures made of non-combustible material provide equipment grounding for minimization of static electricity hazard. All the motor must be spark proof.

Table 2: Process Hazards and Preventive Measures

Sr. No	Area/ Process	Source	Risk	Mitigation
2.1	Induction furnace/ Ladle/ CCM	Heat treatment	Burns, scalding Dust, Fumes	Using inert gas to prevent oxidation
2.2	Rolling Mills	Trapping between the rolls	Injuries Cuts	Nip of rolls must be guarded and Machine part must be guarded, Lock out/tag out must be planned, PPE must be provided

Table 3: Storage Hazards and Preventive Measures

Sr. No	Area	Hazard and Risk	Mitigation measures
3.1	Storage and handling of high speed Diesel (HSD)	Leaks and spill, Falls, Toxicity, Fire or explosion	Catchment basins for spills, PPE should be provided, Fire protection system should be provided.
3.2	Electrical power supply and distribution	Fire	Earthling should be flame proof Training to the worker

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Table 4: Ergonomics & Manual Handling Hazards and Preventive measures

Sr. No	Area	Hazard and Consequences	Mitigation measures
4.1	Material Handling	Manual carrying and lifting of large, bulky and /or Heavy objects. Potential for leading to back pain, hernias, and tendon and ligament injury to the workers.	Immediate Action- stop the activity and provide instructions regarding safe lifting procedures. Longer term Provision- use handling aids such as trolleys, Forklifts for carrying out lifting/implement automation of the work.
4.2	Shifting and dispatch in Rolling Mill straightening Machine	Repetitive work movements. frequent reaching, lifting, carrying) Potential for low back pain-poor posture long duration for Material Shifting and Dispatch	Immediate Action- provides variety in jobs to eliminate or reduce repetition. (over use of the same muscle groups) Longer term Provision- modify work practices so that workers can perform in their "power zone" (above knees, below shoulders, close to body)

Table 5: Work Environment Hazards and Preventive measures

Sr. No	Area	Hazard and Consequences	Mitigation measures
5.1	Fire exit and walkways in Mill area.	End cutting section of rolling Mills is usually stored with Piece of Metal. This causes delayed escape of occupants during the emergency situation which can lead to casualties, injuries. Frequent trips and falls.	Immediate Action- exit way should be cleared of obstructions. Longer term Provision- Training to workshop personnel to ensure scrape and piece of metal is disposed to correctly and regular inspection of exit way should be done.

VI. CONCLUSION

The first step for emergency preparedness and maintaining a safe workplace is defining and analyzing hazards. Hazard identification and Mitigation measures are essential to loss prevention in steel industry. It has become more challenging to conduct hazard identification as the depth of technology has increased, which hazard assessment heavily replies on. Nothing is more important

than the safety and health of people who work in the steel making units. Protecting health and safety of everyone who works in or around the steel industry is of vital importance to steel makers. The duty of care and social responsibility demands that everyone is able to work in a safe and healthy work environment. For any industry to be successful, it is necessary to identify the hazards to assess the associated risks and to bring the risks to tolerable level.

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