Productivity improvement through identifying hazardous conditions in steel foundry

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Abstract: Steel production from past decade shows prominent growth in Indian economy. Rapid strides have also made towards further growth and commissioning of new capacities. One of the prominent Productivity measurement tool in any company is the labor cost and its safety. In this paper, we discuss and identify the core hazardous conditions in steel foundry which may directly effects the productivity of steel industries. We also suggested the measures taken from technologies advancement, and to improve the occupational conditions of foundry.

1. Introduction

Steel plays a very important role in our day to day life. Steel and its alloys can be used in many mechanical and electrical applications. Product of steel plays a very important in sharing market shares as well as increasing development of the country. Steel is the main source of product in many micro and macro industries which cover almost 88% of the total industries of India. Steel will directly improve the social-economic status of the workers and the industries associated with it. Steel is easily available which makes industries to improve their productivity, also makes them flexible to try new products as per the market demands. [1]

Countries GDP shows growth in real time, hence to enhance the GDP of our country, Indian steel industries plays a vital role. More the export of the steel from the country which directly provide fund to the government hence provide better opportunity to become well developed nation. India stood 4th in global map on producing steel and its alloys. Our countries growth mainly depends upon the consumption and utilization of steel also on the growth of export quality of steel.[2]Micro and macro steel production capacity must be enhance in order to increase the profit. Production cannot be increase as provided the safer environment to the workers working in it. Even the lesser the accidents more the workers will feel safe in industry. So to increase the productivity of the industries we must provide a safer work place to the workers. Figure 1 shows main industries that are directly producing steel in larger quantity.[3]
Figure 1. Largest steel industries of India

Figure 2 clearly initiate that the growth of steel production in India is rapidly increasing by passing every year, requirement at global stages may also increasing, accordingly new industries were also emerging in different parts of India (figure 3). [4]

Figure 2. Steel Productions in India

2. Literature review

Occupational health and safety is very important in respect to the productivity of any industry, every industry must create a safer and healthy work environment which makes workers feel safe and sound in working condition. [5]

Every Industry must manage risky situations by following ways:

- List out any hazardous substance which may leads to any accidental situation or may causes harm.
- Provide training to each worker so that it eliminates the possibility of any risk to fatal accident.
- Makes practicable every operation risk free and create a healthier and safer environment within the industry.
- Make sure that all safety measure is well on positions and must be in useable condition at the time of requirement.
- Makes control measure and check all working environment is safe. As well as working condition are risks free and safer. [6]
3. Hazardous conditions

Many types hazardous condition are mentioned in following table 1.

Table 1. Types of hazard

| Sl. No. | Types of hazard | Description/Risk |
|---------|-----------------|------------------|
| 1.      | Physical hazard |                  |
| Sub types | Noise | Higher noise frequency set by the government may have the possible chances of to make noise deficiency or may also the main reason of communication gap between the workers inside the industries. Which also the reason of occupational hazard. |
|         | Heat and cold stresses | There is possible circumstances only where temperature or heat factor influence the safety as they mention below:-(a) temperature or either humidity around the work area are remarkably increases; (b) factory workers are directly imposed to higher temperature working condition; (c)workers working in heavy personal protective equipment may feel the heavy; (d) the temperature must be low within the industries to provide better working |
|         | Working equipment’s and machinery guarding | Proper Training must be provided in to use the equipment’s and power tools in proper way so that many accidents may be avoided. Lack of guarding or poor guards, interlocks, safety devices, improper preservation, no adherence to SMPs etc. can lead to any vital accidents caused by melting, pouring, crushing, cutting operations etc. [7] |
|         | Fire & explosion | Many Steel Plants stores & handles number of highly flammable chemicals i.e tar, naptha, benzol, fuel gases, oils, LPG, Propane, Oxygen etc. which possess potential fire & flare-up hazards. Any type of slag sparks, welding sparks, electrical short circuiting etc. can also lead to fire in material areas if any of the combustible materials are present. |
| Sl. No. | Types of hazard                      | Sub types                                  | Description/Risk                                                                                                                                                                                                                                                                                                                                 |
|--------|------------------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2      | Chemical hazard                    | Sub types                                  | Many disorder may occur due to direct or indirect contact on chemical material with the workers and may causes into the skin disorder or disease.                                                                                                                                                                                                                   |
|        | Chemicals around the workplace     |                                            | The manufacturing of steel involves the utilization and generation of many of inhalable agents that includes, but not limited to, gases, vapors, dust particles, fumes, burns and aerosols. These agents concluded too many toxicological hazards including irritants, chemical asphyxiants, fibrogens, allergy, carcinogens and systemic toxicants. The lungs can be affected by exposure to harmful gases through acute injury to lung tissue;the growth of pulmonary dysfunction may also the development of further lung cancer in future. Silica dust is the most harmful to lungs and causes silicosis disease. As many harmful gases that are might be very dangerous if get inhale and may leads to damaging the many internal organs also leads to the failure of the same. The iron and steel sub particle may contain harmful dust elements which may cause the skin disease, eye irritation etc. May fumes particle directly inhaled may leads to the lungs failure as it decrease the oxygen and leads to death in matter of few seconds [8] |
| 3      | Chemical hazard                    | Ionizing radiation                         | Ionizing radiation is also very harmful to the workers as its effect is may to the life time or may also possibility of leading it to the cancer. The worker working in this type of radiation should wear proper equipment and safety measure to be in a safest condition as mush as possible. Radiation levels to be periodically measured through installation of Radiation Detection equipment’s as per amended 2nd Schedule of Factories Act. |
|        |                                    | Non-ionizing radiation                     | The Non Ionizing radiation may also called as ultraviolet radiation, and direct contact to these type of radiation may leads to internal organ failure or direct contact with eyes may causes cataract also the irritation in eyes. Proper kit should be provided with the industries to workers, working in these types of situations. Direct contact of the eyes to visible and IR radiation may increases the chances of thermal injury to the retina and damage to the lens of the eye, which may result in the formation of cataracts. Direct contact of the eyes to UV radiation can result in inflammation of the conjunctiva and cornea. [9] |
| 4      | Ergonomic Hazards                  |                                            | These types of hazards are due to design of work place and working conditions inside the factory, work station design non-systematic arrangement of machines.                                                                                                                                                                                                 |
| 5      | Psychological Hazards              |                                            | It’s due to work load distribution between staff and some discrimination, bullying and also work load.[10]                                                                                                                                                                                                                                           |
4. Good safety practices

A good safety practice may always help in increases the productivity of any industry. A good safety practices include the following:

- Supervisor must assign and publishing thereresponsibility and duties ofthe employees associated withthe management of the safety in the steel plant.
- Always makes proper Investigate of all the accidents whether small or big and the implementation of corrective measures.
- Studying the significant safety incidents which have happened in other steel plants and learning from the same.
- Recording and control of safety standards and maintaining a register of the significant incidents.
- Internal and external publication of safety investigation results and the obtained experiences.
- Conducting regular shop review meetings regarding status of safety in the shop as well as monthly review meeting at the chief executive level.
- Conducting training as well as refresher safety training programs among the employees where investigation of various incidents are also to be discussed.
- Conducting emergency safety drills.
- Specifically conducting of regular safety audits to locate un-safe areas and practices and to ensure that the corrective actions have been taken. A Safety audits can also help in early detection of the equipment deterioration and the deviations and/or procedures that can degrade or deteriorate the safety levels.

Basic four steps should be followed in order to provide better safety conditions with the industries which may leads to the higher productivity.

The steps are:

1. Identification of Hazards – identifying the situation or places that may cause injury or harm to health and safety
2. Assessing the hazards – evaluating whether any are significant and how likely and serious the injuries or harm would be if workers were exposed to the hazardous situation
3. Controlling the hazards – taking all more practicable steps to eliminate, isolate or minimize the significant hazards in industries.
4. Hazard monitoring should be done and it should be minimize as much as possible.

While Personal Protective Equipment (PPE) may help in minimizing hazards, injury and health hazards are more reliably eliminated, isolated or minimized through new design or safer or mechanized processes.

5. Conclusions

With proper precaution and safety guideline it’s easier to create better production. As well it will provide more safety to the workers which will directly influences the productivity of the industries.

Acknowledgement

This study has not received any grant from government or private organizations.

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