HAZARD IDENTIFICATION AND RISK ANALYSIS IN BLAST FURNACE

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ABSTRACT

Hazard Identification and Risk Assessment or HIRA system can act as a risk assessment tool which will assist users in identifying hazard and estimating risk involved in each identified hazard. This risk assessment tool will identify possible hazard involved in each task in departments. Once the hazard has been identified,risks involved will be estimated and categorized. If the estimated risk falls in a category, which is higher than the low-risk category, then possible control measures will be recommended. At the same time, the user can add new work plan ,task, and control measures into the system to update existing information system.

Key word: *characteristics, documenting historic impacts, Hazard identification,Risk assessment,Risk analysis,Monitor and review*

1. 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.

1.1.HIRA

To manage risk, hazards must first be identified, and then the risk should be evaluated and determined to be tolerate or not. The earlier in the life cycle that effective risk analysis is performed, the more cost effective the future safe operation of the process or activity is likely to be. The risk understanding developed from these studies forms the basis for establishing most of the other process safety management activities under taken by the facility. An incorrect perception of risk at any point could lead to either inefficient se of limited resources or unknowing acceptance of risks exceeding the true tolerance of the company or the community. Occurring from occupational safety hazard to process to work environment hazard.

1.2 HIRA Operation

HIRA reviews may be performed at any stage in a works life cycle-conceptual design, detailed design, construction, Commissioning, on-going operation, decommissioning or demolition. In general, the earlier that a hazard is identified during conceptual design. The more cost- Effectively it can be eliminated or managed. Studies performed during the early design stages are typically done at corporate or engineering offices. Studies performed once a process is near start-up, during operation or before decommissioning are typically done in a plant environment.

A HIRA study is typically performed by a team of qualified experts on the process, the materials, and the work activities-personnel who have formal training on risk analysis methods usually lead these teams, applying the selected analysis technique with subject matter experts from engineering, operations, maintenance and disciplines as needed .A simple early-in-life hazard identification study may be performed by single experts: However, a multi

discipline team typically conducts more hazardous or complex process risk studies, especially during later life cycle stages involving operating and maintenance personnel early in the review process will help to identify hazards when they can be eliminated or controlled most cost- effectively. When the study is complete, management must then decide whether to implement any recommended risk reduction measures to achieve its risk goals.

1.3 PROCEDURE FOR HIRA

At each stage in the work life cycle, a review team questions process experts about possible hazards and judges the risk of any hazards that are identified. Several common methods exist for questioning a design, ranging from simple qualitative checklists to complex quantitative fault tree analysis. The result of the review process is typically documented in a worksheet form, which varies detail, depending on the stage of the work and the evaluation method used. Risk studies on operating processes are typically updated or revalidated on a regular basis.

The purpose of this work is to identify the hazards and risk by analyzing each steps involved in various activity in the construction, and to give suggestion in order to eliminate or reduce the risk assessment(HIRA). 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. The Hazards and risk assessment should be done and actions to be taken to convert the risk to a tolerable level on regular basis.

1.4 HIRAPROCESS:

Figure 1 Diagram of HIRA process

HIRA Process it consists off our steps as follows:

- Hazard identification
- Risk assessment
- Risk analysis
- Monitor and review

1.4. HAZARD IDENTIFICATION

Figure 2 Hazard Identification Information Source diagram

Work place hazards can be identified in a number of ways. Inspections provide a system of recognizing hazardous conditions so that those conditions can be corrected. The data collected while performing inspections will be used to identify hazards and barriers to working safely and in an environmentally protective manner that they can be addressed such as procedure changes or purchasing different PPE. The data also will be tracked as a protective measure of acceptable HSE behavior on the site reports and safe work observation information will be shared with employees at toolbox safety meetings.

2.HAZARD IDENTIFICATION AND RISK ASSESSMENT AT BLAST FURNACE

S-severity, P-probability of occurrence.

Elimination of hot metal exposure during tap hole cleaning

Figure 3 blast furnace

Molten iron produced in a blast furnace is tapped through a hole situated at the bottom of the hearth called Tap hole.

Figure 4 A drilling machine is used to drill the tap hole to tap hot metal from the Furnace

Mud-gun is used to plug the tap hole after the metal is completely drained out during the tapping cycle called casting.

Figure 5 Mud-gun is used to plug the tap hole

After the mass plugging at the end of all casting cycles, the surface of the tap hole has to be made smooth in order to avoid leakage of mass in tap hole during next plugging
The tap hole surface is cleaned manually through chipping / cleaning of tap hole surface by using crow bar. Due to this, worker exposed to higher heat radiation

Figure 6 worker exposed to heat

Reducing hot metal exposure in runner cleaning

Figure 7 hot metal exposure

Hot metal (>1400°C)collected in the earth of the furnace is tapped periodically via tap hole.

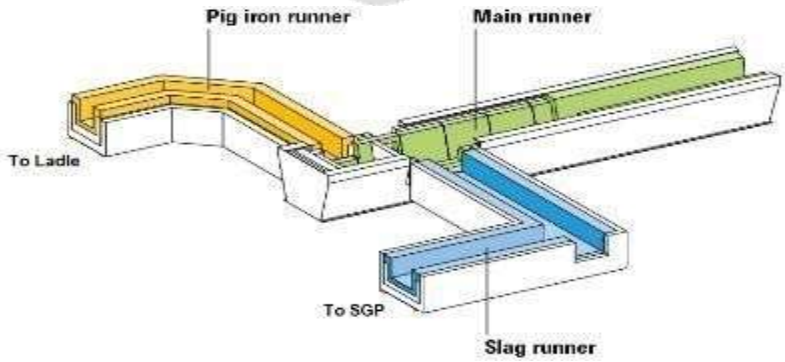


Figure 8 furnace is tapped periodically via tap hole.

Main runner–Conveying hot metal & slag from the furnace
Metal runner – Conveying hot metal to ladle
Slag runner- Conveying slag to SGP

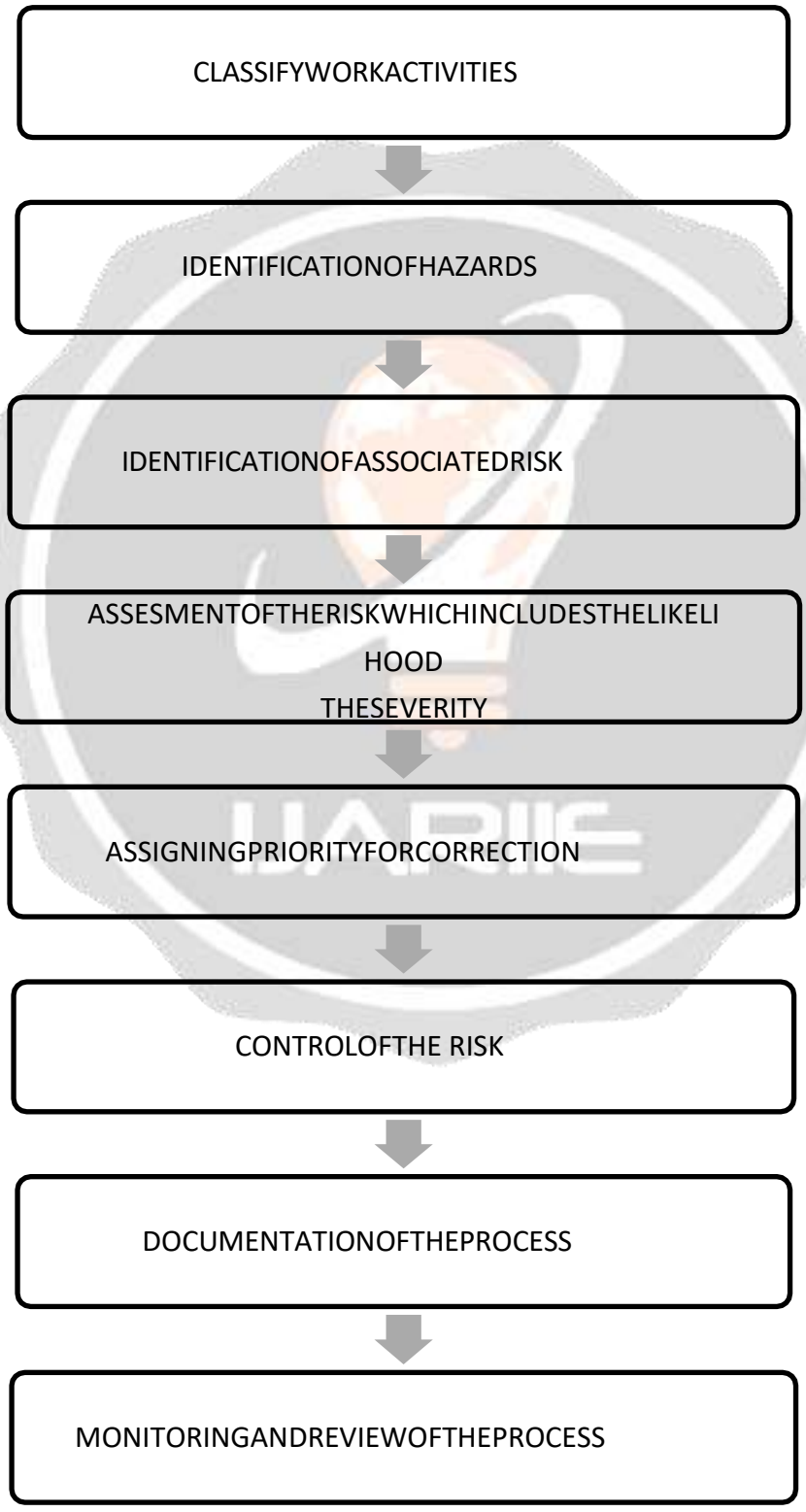
Hot metal is filled into ladles and sent to Steel making unit (Internal Customer).

Figure 9 pouring metal cleaning for next process

After completion of every casting, all runners (Main runner, Hot metal runner & Slag runner) have to be cleaned for next casting.
All three runners are cleaned manually that requires 2,025 Man-hours / Month
(300Casts X 9 man power X 0.75 hours / Cast).

Risk of Non dry (metal and slag not drained completely from the furnace) closing as there is no provision for filling more than four ladles.

3. RISKASSESSMENTMETHODOLOGY



4.1. Semi Quantitative Method:

Semi-quantitative approaches to risk assessment are currently widely used to overcome some of the short comings associated with qualitative approaches. Semi-quantitative risk assessments provide a more detailed prioritized ranking of risks than the outcomes of qualitative risk assessments.

Semi-quantitative risk assessment takes the qualitative approach a step further by attributing values or multipliers to the likelihood and consequence groupings. Semi- quantitative risk assessment methods may involve multiplication of frequency levels with a numerical ranking of consequence. Several combinations of scale are possible.Semi-quantitative risk matrix where the likelihoods and consequences have been assigned numbered levels that have been multiplied to generate a numeric description of risk ratings. The values that have been assigned to the likelihoods and consequences are not related to their actual magnitudes but the numeric values that are derived for risk can be grouped to generate the indicated risk ratings. In this example, Extreme risk events have risk ratings greater than15, High risks are between 10 and 15, and so on. A matrix is used to provide guidance as to whether the risk is acceptable or needs to be addressed.Remember that not all risk can be eliminated. Urgent action is required for risks assessed as critical or high. These actions may include instructions for immediate cessation of the work and or isolation of the hazard until permanent measures can be implemented. Documented control plans with responsibilities and completion dates need to be developed for moderate risks.

4.2 Acceptable Risk:

Risk that is acceptable to regulatory agency and also to the public is called acceptable risk. There are no formally recognized regulatory criteria for risk to personnel in them in industry. Individual organizations have developed criteria for employee risk and the concepts originally arising from chemical process industries and oil and gas industries.Because of the uncertainties linked with probabilistic risk analysis used for quantification of the risk levels the general guiding principle is that the risk be reduced to a level considered As Low as Reasonably Practicable (ALARP).

Risk Rank Likelihood x Consequence		Consequence Level(C.L)					
		1	2	3	4	5	
Likelihood Level(L.L)	Descriptor	Injury	First Aid	Recordable Injury	Lost Time	Fatality	RISK RATING (R.R)
5	Almost Certain	5	10	15	20	25	Extreme (16-20)
4	Likely	4	8	12	16	20	High (11-15)
3	Possible	3	6	9	12	15	Moderate (6-10)
2	Unlikely	2	4	6	8	10	Low (1-5)
1	Rare	1	2	3	4	5	

Table 1 risk assesment

5. RESULT AND CONCLUSION

Elimination of hot metal exposure during tap hole cleaning

Figure 11 Elimination of hot metal exposure during tap hole cleaning

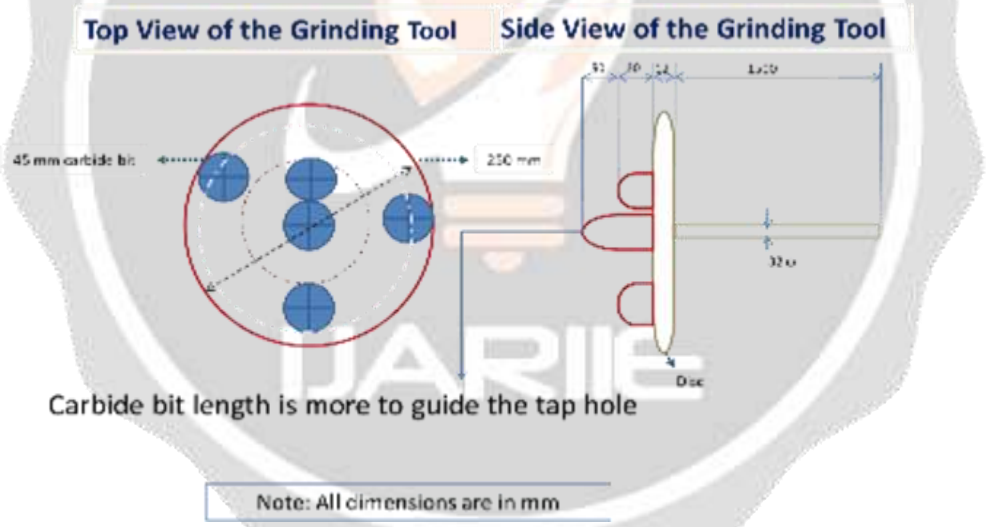
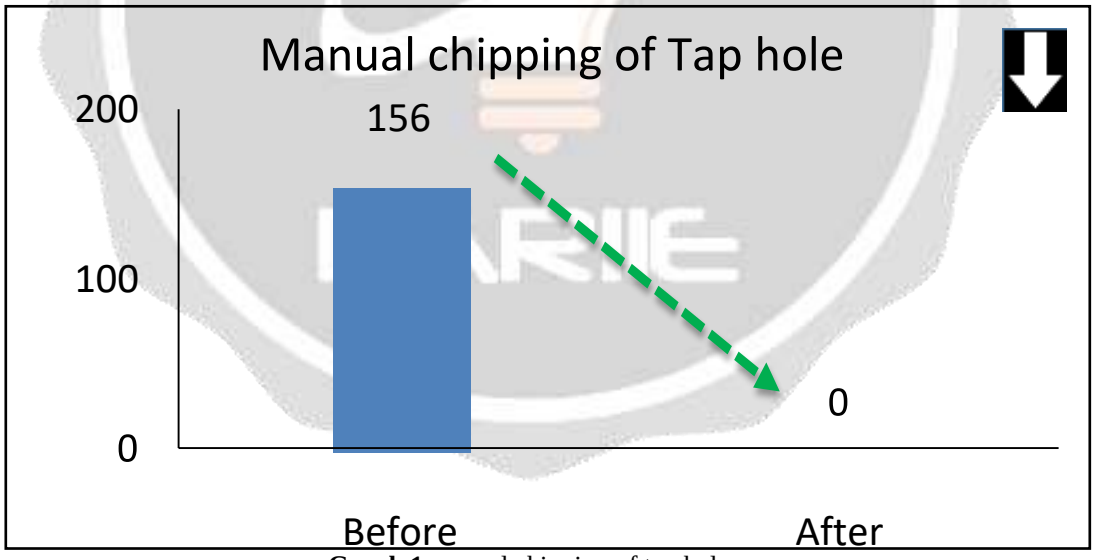


Figure 12 New tool has been developed by mechanical team as per the idea of the associate

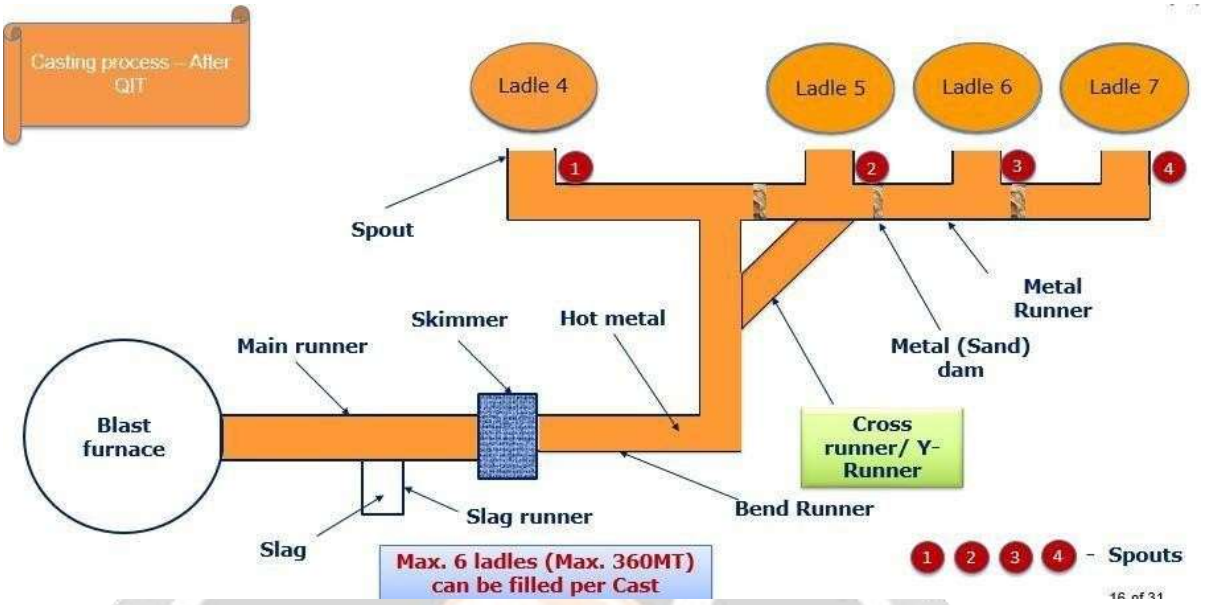
Figure 13 Newly developed tool is attached with existing tap hole driller machine

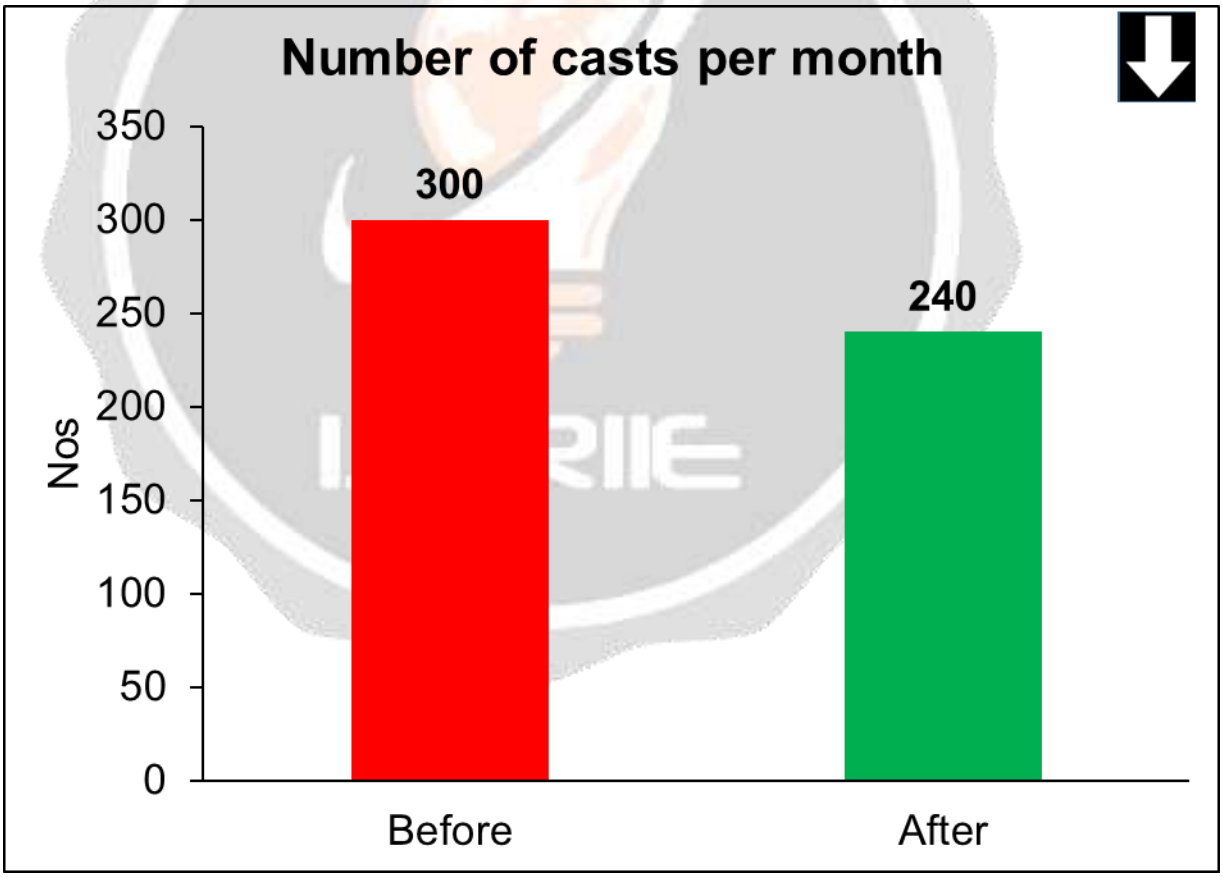
Tap hole surface grinding is done mechanically through drilling machine and smooth tap hole surface is obtained through this



Graph 1 manual chipping of tap hole

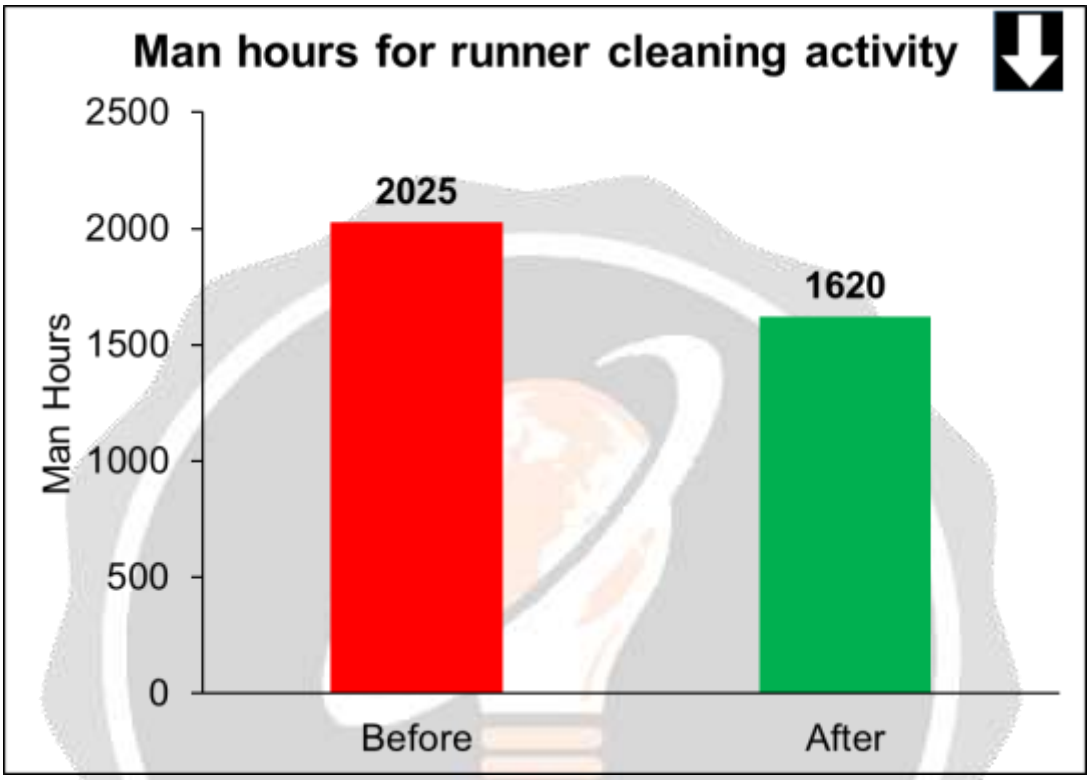
Reducing hot metal exposure in runner cleaning





Graph 2 number of casts per month

Number of casts / month has been reduced by increasing the tapping duration / cast from 90 minutes to 130 minutes.



Graph 3 Man hours for running activity

Man hours for running activity has been reduced from 2,025 to 1,620hours/month. Cast house worker's safety is improved by elimination of Non dry cast closing Higher hot metal production is sustained.

CONCLUSION

Organizations are becoming increasingly aware of the need to provide a work place that is not only free of common injuries but one that also protects workers, facilities, and the environment from the consequences of more serious incidents involving safiety, security, environmental, and their risks. Considering the human sufferings and economical loss due to accidents, it becomes imperative on the part of every one to prevent the accidents byre moving or controlling the hazards in industries. In all sets of safety, they fulfilled all the norms except the conditions of working and the house keeping of the company which may leads to occur high risk and hazards. Recommendation for the company to work for the better working condition and housekeeping should be in proper manner.

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