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Hazard Identification and Risk Assessment in Fettling Process

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Abstract:
The main intent of the paper is to prevent accidents in fettling process by using Hazard Identification and Risk Assessment tool. To succeed in any casting industry specifically fettling process is acknowledged from the literature review. First identify the hazards to assess the associated risks and to bring the risks to a sustainable level. Conduct hazard identification and risk analysis to identify potentially hazardous events, analyze dangerous mechanisms for possible adverse events, and generally assess the extent, extent, and likelihood of adverse effects. Hazard identification and risk assessment can be used to prioritize so that the riskiest condition can be solved earliest, and later, the slightest likely to occur and the slightest likely to cause foremost problems. Operations involved in fettling process such as Knock out, De-gating De-coring, Shot blasting, Grinding (Manual, Automatic), Rework and Painting. In HIRA Analysis Severity, Likelihood, Risk Score, Risk Ranking and Risk Factor are calculated. It can be noted that the accident level is reduced about 3% from the beginning level after implementation of HIRA and Corrective actions.

Keywords: Hazard, Risk, Casting, Fettling, HIRA, Safety

I. INTRODUCTION

Fettling the subtraction of feeders and overload material from a casting is the primary stage of concluding a casting. The metal removal is frequently achieved using physical cutting or grinding. Though, more prominence is being placed on regular fettling, whereby the casting is placed in a machine programmed to remove resources from explicit areas.

The way of fettling has to be taken into account at the original casting design phase, so that the method is quick and proficient. Many researchers have been supported that 84-94 % of industrial accident occurred due to the unsafe behavior of the worker. The unsafe behavior of worker affects the safety climate of an organization in three paths namely indirectly through the sequential influence of other mediating factors of perceived work pressure, perceived risk, and perceived barriers, through direct influence on perceived barriers which, in turn, affects unsafe work behavior, and direct influence on unsafe work behavior. HIRA is used to identify and evaluate all the hazards of fettling process.

Organizations often adopt safety management system or behavior-based system approaches to managing their safety functions in an attempt to achieve performance excellence. The organization develops the ideas around a system of safety management practices (ten practices were elaborated), to test their relationship with objective safety statistics (such as accident rates), and to explore how these practices work to achieve positive safety results (accident prevention) through worker engagement.

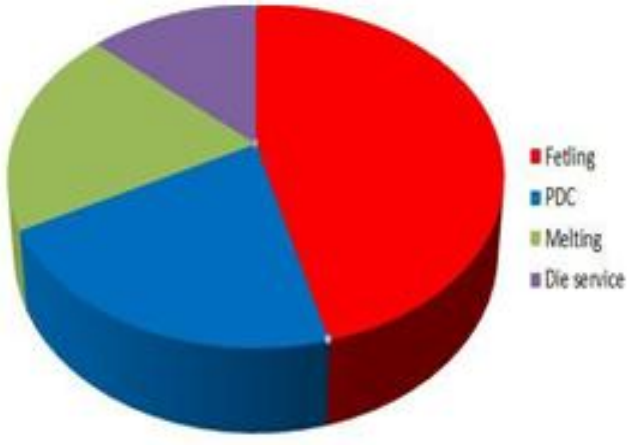
there is a significant negative relationship between the level of safety-focused worker emotional and cognitive engagement with accident rates; safety management systems and worker engagement levels can be used individually to predict accident rates; safety management systems can be used to predict worker engagement levels; and worker engagement levels act as mediators between the safety management system and safety performance outcomes (such as accident rates). Implications: Even though the presence of safety management system practices is linked with incident reduction and may represent a necessary first-step in accident prevention, safety performance may also depend on mediation by safety-focused cognitive and emotional engagement by workers. Thus, when organizations invest in a safety management system approach to reducing/preventing accidents and improving safety performance, they should also be concerned about winning over the minds and hearts of their workers through human performance-based safety management systems designed to promote and enhance worker engagement.

Hazard Identification and Risk Assessment (HIRA) is a structured and systematic examination of planned or existing processes or operations to identify and assess issues that may pose a risk to personnel or equipment or prevent effective operation.

II. PROBLEM IDENTIFICATION

It was found that first aid accidents issues are very high in a foundry. The operation like melting of ingots, fettling, trolley handling are carried out in foundry. In the foundry accident rate are increasing frequently. It affects the employee towards the job they carried out. So the accident investigation register had been reviewed and found that, temporary employee contribute the 60% of first aid accidents when compared to the other category of employees. The temporary employees are highly employed in fettling are

a. So the first aid accidents are high in fettling area when compared to other areas in the foundry or a similar sans-serif font). Callouts should be 9-point non-boldface Helvetica. Initially capitalize only the first word of each figure caption and table title. Figures and tables must be numbered separately. For example: “Figure 1. Database contexts”, “Table 1. Input data”. Figure captions are to be centered below the figures. Table titles are to be centered above the tables.



2.1 Experimental Investigation

This is the process of examining each work area and task to determine all "inherent in the work" hazards. Areas of work include but are not limited to mechanical workshops, laboratories, office areas, agricultural and horticultural environments, shops and transport, maintenance and reason, rearrange, lecture hall and teaching space. Tasks may comprise using screen-based equipment, audio and video equipment, industrial tools, hazardous materials and / or teaching handling personnel, driving a vehicle, handling emergencies building. This process is about finding impressive that can injure in your job or area.

Hazard: The workplace can cause harm (ie, can result in personal injury, occupational-related illness or death).

Risk: The possibility of actual danger of injury or illness. It is based on the consequences and the possibilities.
Risk Assessment is defined as a method of assessing the risks connected with each recognized hazard in order to recognize the nature of the risk. This includes the nature of the hazards that may result, the severity of the hazards, and the probability of the hazard occurring.

Risk control: Take measures to remove health and safety risks as far as are reasonably practicable. Where the risk cannot be eliminated, controls need to be put in place to minimize the risk as much as reasonably possible. The level of control has been developed and is described below to help select the most appropriate risk control measures.

Monitoring and review: This involves continuously monitoring the identified hazards, assessing therisk and risk control processes and reviewing them to ensure their effective functioning. The above-mentioned activities are done in fettling process and results are tabulated.

III. RESULTS AND DISCUSSION

HIRA analysis is done in fettling process such as Knock out, De-gating Decoring, Shot blasting, Grinding (Manual, Automatic), Rework and Painting. In HIRA Analysis Severity, Likelihood, Risk Score, Risk Ranking and Risk Factor are calculated and tabulated in table 2.

Non – Significance and Significance risk level of operations are found and corrective actions are taken. After corrective actions implemented HIRA analysis is done. Accident level is reduced about 3% from the beginning level.

Table .1. Operations involved in fettling process

S.No	Operations	
1	Knock out	Loading the mould trolley in the Rail
2		Using crane to load the mould trolley in vibrator
3		Positioning the mould trolley in the vibrator
4		Removal of sand and casting
5		Checking
6		Transport the castings to the next stage
7	De-gating (hydraulic wedge cutter)	Unloading the castings
8		Using Hydraulic wedge cutter to remove the Runner and riser
9		Manual inspection
10		Transport the castings to the next stage
11	De-coring (pneumatic hammer)	Unloading the castings
12		Using Pneumatic hammer to remove the core inside the casting
13		inspection
14		Transport the castings to the next stage
15	Shot blasting	Loading the castings in the blasting Trolleys
16		Open the shot blasting machine
17		Loading the castings inside the blasting Machine
18		Processing in the machine
19		Unloading the castings
20		Visual Inspection
21		Transport to the next stage
22	Grinding (Manual)	Unloading the castings
23		Check the grinding wheel
24		Mount the Grinding Wheel
25		Using Swing grinding machine to grind the riser and ingrate location in castings
26		Visual Inspection
27		Loading the castings in the trolley
28		Moving to Next Stage
29	Grinding (Automatic)	Unloading the castings
30		Check the grinding wheel Condition
31		Loading the Castings in magnetic bed
32		Lock the bed
33		Switch on the machine
34		Grinding Operation
35		Visual Inspection
36		Unlock the Bed
37		Unloading the castings
38		Moving the trolley to the next stage
39		Unloading the casings in

		the trolleys
40	Rework	Visual inspection
41		Removal of any left out burrs in castings
42		Grinding
43		Visual Monitoring
44		Loading the Castings in the trolley
45	Painting	Unloading the castings
46		Loading the paint in spray gun
47		Cleaning the castings
48		Painting to the castings
49		Drying work
50		Loading the Castings in trolleys
51		Moving the Trolleys to the next stage
52		Packing

Table .2. HIRA Analysis

S.NO	Serverit	Like hood	Risk Score	Risk Rankin	Risk Factor
1	4	3	12	4	Significance
2	4	3	12	4	Significance
3	3	2	6	3	Non - Significance
4	3	2	6	3	Non - Significance
5	2	2	4	2	Non - Significance
6	3	2	6	3	Non - Significance
7	3	2	6	3	Non - Significance
8	4	3	12	4	Significance
9	2	1	2	1	Non - Significance
10	3	2	6	3	Non - Significance
11	3	2	6	3	Non Significance
12	4	3	12	4	Significance
13	2	2	4	2	Non - Significance
14	3	2	6	3	Non - Significance
15	4	3	12	4	Significance
16	3	2	4	3	Non Significance
17	4	3	6	4	Significance
18	2	2	12	2	Non - Significance
19	3	2	6	3	Non - Significance
20	2	2	4	2	Non - Significance
21	3	2	6	3	Non - Significance
22	3	2	6	3	Non - Significance
23	3	2	6	3	Significance
24	3	2	6	3	Non - Significance
25	4	4	16	5	Significance
26	2	2	4	2	Non - Significance
27	3	2	6	3	Non - Significance
28	3	2	6	3	Non - Significance
29	3	2	6	3	Non - Significance
30	2	2	4	2	Non - Significance
31	3	2	6	3	Significance
32	4	3	12	4	Significance
33	3	2	6	3	Non - Significance
34	4	4	16	5	Non - Significance
35	2	1	2	1	Non - Significance
36	2	2	4	2	Non - Significance
37	3	2	6	3	Non - Significance
38	3	2	6	3	Significance
39	3	2	6	3	Non - Significance
40	2	2	4	2	Non - Significance
41	4	3	12	4	Significance
42	4	4	16	5	Significance
43	2	1	2	1	Non - Significance
44	3	2	6	3	Non - Significance
45	3	2	6	3	Non - Significance
46	3	2	6	3	Non - Significance
47	2	1	2	1	Non - Significance
48	2	2	4	2	Significance
49	3	2	6	3	Non - Significance
50	2	2	4	2	Non - Significance
51	2	1	2	1	Non - Significance
52	3	2	6	3	Non - Significance

IV. CONCLUSION

In an organization no single section or department can develop a positive health and safety culture on its own. There needs to be the commitment to the management, the promotion of health and safety standards, effective communication within the organization, co-operation from and with the workforce and an effective and using HIRA. Each of these topics in HIRA will be examined in turn to show their effect on improving the health and safety culture in the organization. The provision of information and training for employees will develop their awareness and understanding of the specific hazards and risk associated with their jobs and working environment. To be successful in fettling process, first identify

the hazards to assess the associated risks and to bring the risks to a sustainable level. Conduct hazard identification and risk analysis to identify potentially hazardous events, analyze dangerous mechanisms for possible adverse events, and generally assess the extent, extent, and likelihood of adverse effects. Hazard identification and risk assessment can be used to prioritize so that the most risky condition can be solved earliest, and later, the slightest likely to occur and the slightest likely to cause foremost problems. HIRA analysis is done in fettling process. Operations involved in fettling process such as Knock out, De-gating De-coring, Shot blasting, Grinding (Manual, Automatic), Rework and Painting. In HIRA Analysis Severity, Likelihood, Risk Score, Risk Ranking and Risk Factor are calculated. Non – Significance and Significance risk level of operations are found and corrective actions are taken. After corrective actions implemented HIRA analysis is done. Accident level is reduced about 3% from the beginning level.

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