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ASSEMBLY LINE COLLISION CONTROL

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ABSTRACT

In this paper, risk priority factor of an industrial problem were discussed. In Ashok Leyland, Ennore unit engine assembly in the H-cylinder, all the components from various shops will be brought here and assembled by the workers. These workers stay at each station. There is a roller slider like conveyor running through all the stations. Initially the engine block is clamped on a tray at the first station, this tray travels on the sliders throughout the station. There are twenty two trays lined up on the sliders and the components are fixed on the engine block at each station by the workers. These trays have rollers mounted under it so that it moves freely on the slider. There is possibility of collision of the trays against each other when it moves from one station to another. Also these trays moves freely on the sliders while the components are being fixed, as a result it is difficult for the workers to ensure grip while screwing and doing other works. Right now they use the help of others to hold the tray while fixing critical components like flywheel and fuel injector. In addition to this the production time is also affected. In this paper, how to prevent the accident in industry by calculating RPN for fabrication and assembly to ensure safety of labours were discussed.

1. INTRODUCTION

In an industry many hazards can occur at any instant, which may result in the potential damage to machine, harm or adverse health effects to labours. There are many methods to find hazards like FMEA, ETA, FTA, HAZOP, etc,. Each technique has its own merits and demerits. These techniques are used in many industries to find hazards and root causes for improving labour safety, because in today's industries are producing products of various kinds in a large volume. Many of the industries are changing their systems from manual to automation. In a small flaw in those automation machineries can result huge loss to the management in terms of money as well as human lives. As an engineer it is necessary to give a simple solution to the problems and make sure the safety of the labours.

2. METHODS IN RISK ASSESSMENT

There are many methods in risk assessment. One method has advantages over another method. Some of the methods are as follows,

1. Hazard Identification and Risk Assessment (HIRA)
2. Failure Mode and Effect analysis(FMEA)
3. Fault Tree Analysis (FTA)
4. Event Tree Analysis (ETA)
5. Hazards and Opportunity Test(HAZOP)

3. HAZARD IDENTIFICATION AND RISK ASSESSMENT

This technique helps to identify which hazard pose the greatest threat and also list out the hazards exist in and around our system. HIRA can tell how much damage the hazards cause. Hazard Identification and Risk Analysis (HIRA) is a collective term that encompasses all activities involved in identifying hazards and evaluating risk at facilities, throughout their life cycle, to make certain that risks to employees, the public, or the environment are consistently controlled within the organization's risk tolerance. These studies typically address three main risk questions to a level of detail commensurate with analysis objectives, life cycle stage, available information, and resources.

4. STEPS OF HIRA

There are four steps in HIRA, they are as follows

1. Hazard identification
2. Risk Assessment
3. Risk Analysis
4. Check and review

The objective is to perform only the level of analysis necessary to reach a decision, because insufficient analysis may lead to poor decisions and excessive analysis wastes resources. A suite of tools is available to accommodate varying analysis needs: (1) tools for simple hazard identification or qualitative risk analysis include hazard and operability analysis (HAZOP), what-if/checklist analysis, and failure modes and effects analysis (FMEA), (2) tools for simple risk analysis include failure modes, effects, and criticality analysis (FMECA) and layer of protection analysis (LOPA), and (3) tools for detailed quantitative risk analysis include fault trees and event trees

4.1 HAZARD IDENTIFICATION

All the hazards are separated based on the damage can they cause to the system. This step needs some data like records. In this step the consequence of each hazard is noted. The consequences may be social, environmental, financial and psychological. In addition to this, the frequency of the hazards also calculated using previous year's data.

4.2 RISK ASSESSMENT

In this step the consequence of each hazard is noted. The consequences may be social, environmental, financial and psychological.
In addition to this, the frequency of the hazards also calculated using previous year's data.

4.3 RISK ANALYSIS

In industry, each hazard is examined based on the Severity, Occurrence and Detection. The Risk Priority Number (RPN) is calculated using the above elements.

4.4 RISK PRIORITY NUMBER (RPN)

The factors which consider to calculate RPN as
Severity (S) - Severity is a numerical subjective estimate of how severethe customer (next user) or end user will perceive the EFFECT of a failure.

Occurrence (O) - Occurrence or sometimes termed LIKELIHOOD is a numerical subjective estimate of the LIKELIHOOD that the cause of a failure mode will occur during the design life, or during production in the case of a Process HIRA.

Detection (D) - Detection is sometimes termed EFFECTIVENESS. It is a numerical subjective estimate of the effectiveness of the controls to prevent or detect the cause or failure mode before the failure reaches the customer. The assumption is that the cause has occurred.

RPN value is the measure of the hazards effect. Normally RPN value is calculated using the formula,

RPN= Severity * Occurrence * Detection

Based on the company standards the maximum allowable RPN value may varies from 5 to 50. Depending upon the value the risk are prioritized to high to low.

5 CHECK AND REVIEW

After analyzing the RPN values and frequency, most danger and unlike hazard is identified and necessary action taken to eliminate that hazard. Completion of the technique, the system is reviewed over a period of time continuously

6 OBSERVATIONS

In an industry the Hazard Identification and Risk Assessment technique is more preferable. For implementing HIRA, One need to identify all hazards which may occur in an industry. Second step is to list down the consequences and frequency of each hazard. Third is to calculate the risk priority number using formula. Last step is to identified the most danger unlike hazard and the system is reviewed continuously at a period of time.

Using HIRA method around 20 activities were observed and around 6 hazards were identified in the engine assembly shop, Ashok Leyland.

7 TABULATION AND CONCLUTION

S.No	Elements of activities	Hazard	Risk	Risk assesment			RPN
1	**Loading/Unloading Component**			**S**	**P**	**EL**	**S*P*L**
	Loading of component in to the fork lift	Fall of component	Injury to body parts	3	3	1	9
	Unloading of component in stores	Fall of component	Injury to body parts	3	3	1	9
	Movement of emptyfork lift	Hit aginst the person	Injury to body parts	3	3	1	9
2	**Movement of components by trolley**						
	Loading of component in to the washing tray	Fall of component	Injury to body parts	2	3	1	6
	Movement of tray by hand	Hit aginst the person	Injury to body parts	2	2	1	4
	Unloading of component in to the washing tray	Fall of component	Injury to body parts	2	2	1	4

Hira method RPN identification

Using HIRA method, table shown above the activities are observed as given in the above table and the RPN value and frequency is calculated based on the observation. Using these data one can easily find out which hazard has the great impact on the industry. So that the one can spend some more time to eliminate hazards before it happens.

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