Risk Assessment and Hazard Identification Using OHS Analysis in Manufacturing

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Abstract :- Hazard Identification and Risk Assessment (HIRA) is a preventive tool widely adopted in automobile component manufacturing industries to identify potential hazards and evaluate associated risks within the workplace. Systematic evaluation of workplace hazards is essential to determine the root causes of accidents and to develop effective preventive measures. While it may not be feasible to eliminate all hazards, the objective of HIRA is to eliminate or control high-risk hazards and minimize the remaining risks to an acceptable level, thereby ensuring worker safety. The risk rating is determined by the product of severity and likelihood, with the overall risk categorized into four levels: low, medium, high, and very high. Both existing and additional control measures are identified and implemented to safeguard employees in the automotive components manufacturing industry.

Keywords: Hazard identification, Risk assessment, Severity, Likelihood, Occupational safety, Automobile components industry

1. Introduction

Hazard Identification and Risk Assessment (HIRA) is a primary tool applied across industries as a proactive safety approach to prevent accidents. In the automobile components manufacturing sector, achieving operational success requires safety, reliability, and sustainability. To meet these requirements, industries must identify potential hazards, assess associated risks, and reduce them to a tolerable level. HIRA facilitates this process by systematically identifying undesirable activities that may lead to hazards, analyzing the risks of such events, and estimating their potential severity, likelihood, and harmful consequences.

Objectives

The objective of this work on hazard identification and risk assessment is to identify and examine hazards, trace the event sequences leading to risks, and evaluate the hazards associated with unsafe activities. A wide range of methodologies, from simple qualitative techniques to advanced quantitative approaches, are available to support hazard identification and risk analysis. Since each method has its own purpose, strengths, and limitations, the use of multiple hazard analysis techniques is recommended. Implementing an improved HIRA framework not only enhances worker safety—both physical and psychological—but also increases productivity and job satisfaction.

2. Methodology

Hazard Identification and Risk Assessment (HIRA) is a systematic process that involves sequential steps, including hazard recognition, evaluation of consequences and frequency, risk estimation based on existing controls, and recommendations to mitigate risks that exceed acceptable limits. For HIRA to be effective, organizational procedures must address hazards, associated risks, control measures, and proper documentation.

The HIRA team is typically led by the Environment, Health, and Safety (EHS) department and includes representatives from production, maintenance, quality, and security. A Risk Register is prepared based on the findings of the Initial Status Review. Observations are carried out to document work activities in each process, considering both routine and non-routine tasks performed by all personnel accessing the workplace.

Risk assessment is conducted using a 4×4 matrix, combining the severity of harm and the likelihood of occurrence to determine the level of risk. This structured approach forms the foundation of the organization's Safety and Health Management System by ensuring that significant risks are systematically identified, evaluated, and controlled.

3. HAZARD AND RISK IDENTIFICATION

3.1 Initial Status Review

The initial status review establishes the baseline for evaluating EHS performance improvement. It comprises three stages:

1. **Desk Study** – A review of health and safety prompt lists, permits, licenses, safety data sheets, monitoring results, and other EHS records to identify major hazards before the site visit.
2. **Site Visit** – On-site observations to document the work environment, tasks performed, risk-prone activities, written procedures, work permit systems, environmental conditions, access arrangements, and adequacy of emergency preparedness (escape routes, communication systems, equipment, and drills).
3. **Hazard Evaluation** – Analysis of the identified hazards to determine potential risks, their likelihood, and possible consequences.

3.2 Work Activities Classification

Work activities are classified to ensure comprehensive risk identification. Classification is based on:

- Geographical areas (inside and outside the premises),
- Stages of the manufacturing process or service provision,
- Planned and unplanned/reactive activities,
- Defined projects, or a combination of the above.

For each activity, details such as duration, frequency, location, training of personnel, and existing risk controls are recorded.

3.3 Process of Hazard and Risk Identification

Hazard identification is guided by three key questions:

1. **Is there a source of harm?**
2. **Who (or what) could be harmed?**
3. **How could the harm occur?**

The process considers:

- Routine and non-routine activities,
- Employees, contractors, and visitors,

- Infrastructure, systems, and materials at the workplace,
- Hazards arising from external sources that could affect workplace safety,
- Human factors including behavior, competence, and limitations.

4. RISK IDENTIFICATION

4.1 Desk Study

The desk study supports the identification of primary hazards through:

- Health and safety checklists,
- Review of permits, licenses, safety records, and monitoring data,
- Assessment of existing EHS documentation.

4.2 Site Visit

The site visit consists of detailed hazard identification across all operations. This includes:

- Workplace layout and activity mapping,
- Tasks at risk and corresponding control measures,
- Permit-to-work systems for hazardous activities,
- Environmental conditions influencing safety,
- Emergency preparedness (escape routes, equipment, communication, and procedures).

5. RISK ASSESSMENT

The identified hazards are evaluated to determine their risk levels. The risk is calculated using:

Risk Score = Severity × Probability

- **Base Risk** – Calculated before considering existing control measures.
- **Acceptable Risk** – Calculated after accounting for current controls.
- **Significant Risk** – Determined if the risk level remains high despite controls.

5.1 Parameters of Risk Assessment

1. **Severity Matrix** – Considers potential harm, body part(s) affected, and number of employees exposed.
2. **Probability Matrix** – Considers frequency of occurrence, duration of exposure, failure of equipment/systems, adequacy of PPE, unsafe acts, and other influencing factors.

Table 5.1.1 Probability of Occurrence

Probability Level	Description	Frequency
1 – Highly Unlikely	Rare events	> Once a year
2 – Unlikely	Possible but infrequent	Once a month – Year
3 – Likely	Expected in normal operations	Once a week – Month

Probability Level	Description	Frequency
4 – Very Likely	Frequent	Multiple times per day – Week

When scoring hazards, both severity and probability are considered along with the adequacy of existing control measures.

5.2 Identification of Risk Levels

- **Base Risk**: Initial score of severity × probability (without controls).
- **Acceptable Risk**: Reduced risk level after accounting for existing controls.
- **Significant Risk**: Risks that remain above acceptable limits despite controls and require additional mitigation measures.

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