International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 05, May-2019

Safety In Petrolium Industry

(Hazard Identification & Risk Assessment)

Pradeep Chutelkar
M.tech Student
Department of Mechanical Engineering
Bhilai Institute of Technology
Raipur, India

Manish Kumar Mishra
Assistant Professor
Department of Mechanical Engineering
Bhilai Institute of Technology
Raipur, India

Abstract— **Hazard Identification is a proactive process to identify hazards and eliminate or minimize/reduce the risk of injury/illness to workers and damage to property, equipment and the environment. It also allows us to show our commitment and due diligence to a healthy and safe workplace. We must identify hazards and potential hazards in the workplace in order to be able to take action to eliminate or control them.**

This is a step by step process to guide responsible persons to an effective hazard identification, assessment and controls system. The steps include:

- **Hazard Assessment: identifying the hazards and potential hazards, determining the risks and the risk designation (rating) associated to the hazard based on probability, severity and frequency.**
- **Hazard control - controlling the hazards and the risks associated with the hazard.**
- **Providing information, education, training and supervision on the hazards, risks and controls for employees affected by the hazards.**
- **Review of the hazard assessment and control process. Activities conducted in adverse weather conditions**

Keywords—Risk Evaluation Assessment; formatting; Hazard Checklist; Hazard Identification;

I. INTRODUCTION

Hazards Identification and Risk Assessment study is carried out by multidisciplinary team who reviews the process to discover the potential hazard s and operability problems using a set of guide words. The basic concept of HIRA study is to take full description of the process and to question every part of it to discover what deviations are the intension of the design can occur and what consequence of deviation may be .This is by applying guide words.

Technique for identifying and analyzing the hazards and operational concerns of a system. Central activity – a methodical investigation of a system description (design representation).

II. PROBLEM IDENTIFICATION

A. Risk Evaluation Assessment

Risk evaluation & assessment is the systematic evaluation of the risks associated with the identified hazards. The objective being to ensure the risk associated with Terminal Activities is as low as reasonably practicable (ALARP). Risk assessment analysis process will identify certain activities for which detailed written method statement or safe systems of work are required to ensure that the activities are properly controlled and executed safely and without risk to health and the environment. All such written safe systems of work will clearly identify the objective, the sequence of operations, foreseeable hazards, precautionary and protective measures required and will be easily understood by the personnel who are to supervise and carry out the work. Terminal engineers and supervisors with the assistance of the HSSE manager shall conduct a risk assessment for the following conditions:

- First Time activities / jobs
- New employees are assigned a job
- Emergency repairs
- Activities conducted in adverse weather conditions
- Pre-commissioning activities, and
- Activities requiring risks assessments

It shall be the responsibility of the terminal Head to ensure that the Engineers and HSSE Managers have conducted risk assessments and that involved terminal personnel are advised and comply with precautionary measures. It shall be the responsibility of the HSSE manager to maintain all documentation risk assessment information.

B. Hazard & risk assessment

Hazard means anything that can cause harm (e.g. chemicals, electricity, working from ladders, etc).

Risk is the chance, high, low, that somebody will be harmed by the hazard. When you access the risks the important things you need to decide are whether a hazard is significant, and whether you have it covered by satisfactory precautions so that the risk is small.

Risk assessment is the systematic identification of the hazards associated with work and the evaluation of the risks associated with those hazards. A hazard - risk assessment shall take account of all the work activities and consideration shall also be given to anyone else who could be affected by the work activities.

RISK=PROBABILITY X EXPOSURE X COSEQUENCE

(This work is licensed under a Creative Commons Attribution 4.0 International License.)

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 05, May-2019

III. METHODOLOGY

A. *Hazard Identification*

The team identified for risk assessment studies the scope of work and the particular HSSE specifications to identify the hazards associated with the work to be executed.

Normally following Health, Safety & Environmental hazards that may be present during the Terminal activities :

TABLE I. TABLE STYLES

SAFETY	*HEALTH*	*ENVIRONMENTAL*
• Fire • Toxic gas • Falling from height • Dropped objects / materials handling. • Electrocution • Incorrect use of tools • Unsafe driving of vehicles leading accident • Failure of lifting gear (in case of any lifting operation) • Accident due to equipment • Scaffolding	• Food Contamin ation / Catering problems • Water problems • Animal / Insect Bites, etc. • Hygiene • Sanitation • Noise • Sickness • Others	• Oil Spills • Atmospheric Emissions • Waste disposal • Hazardous & toxic waste disposal • Others

B. *Hazard Checklist*

This is an aide-memoir of hazards presented by work activities and equipment which require risk assessment. This is an illustrative list and is not exhaustive.

TABLE II. TABLE STYLES

MECHANICAL Trapping Crushing Impact Friction/Abrasion Entanglement Shearing Puncture Pinch or Nip Point Stored Energy Vibration	ELECTRICAL Shock Short Circuit Sparking Arcing Fire Explosion Overheating Portable Appliances
RADIATION Alpha Beta Gamma X ray Infra red Ultra violet Microwave Radio	FLAMMABLE Solids Liquids Gases Sources of Ignition Emergencies
PLACE OF WORK Access Housekeeping Slip, Trip, Fall Confined Spaces Work at Heights Excavation Demolition Work Near or Over Water Stacking Storing Obstruction Ergonomics Transport	HEALTH Dust Vapours Gases Fumes Asphyxiants Corrosives Heavy Metals Pesticides Herbicides Insecticides Carcinogens Sensitisers
ENVIRONMENTAL Weather, Noise Temperature Lighting Ventilation Pressure Vacuum, Humidity	ORGANISATION Safe System of Work Provision of Equipment Provision of Information Supervision Training Fieldwork Lone Working Contact with Public Violence

C. *Procedure for risk assesment*

Follow these five steps:

- Look for the hazards thru job safety analysis for all critical operations
- Decide who might be harmed and how
- Evaluate the risks and decide whether the existing precautions are adequate or whether more should be done
- Record your findings
- Review your assessment and revise it if necessary All the risks to be brought to ALARP after providing significant control measures
- Table Styles

Prioritising Risks					
Severity	**Probability**				
	5	4	3	2	1
5	25	20	15	10	5
4	20	16	12	8	4
3	15	12	9	6	3
2	10	8	6	4	2
1	5	4	3	2	1

TABLE III. TABLE STYLES

Product	*Risk Rating*	*REQUIREMENTS FOR CONTROL MEASURES*	*ACTIONS TO BE TAKEN*
Severity X Likelihood			
1 to 5	Low	Low level of control measure required: adequate supervision, training and information	Review regularly to ensure that the risk does not increase
6 to 15	Medium	Moderate level of control measures , as above but with engineering and safety	Review to assess whether risk can be reduced: ensure competence levels
16 to 25	High	This level of risk is unacceptable as there is a high probability of major harms occurring. High level of control is required; permits to work, specialist safety equipment, strict supervision etc.	Alternative methods should be used that remove or reduce the risk wherever possible This high risk must be strictly controlled and only authorized competent persons allowed in and around the Hazard.

IV. RESULTS & CONCLUSION

Essentially, the HIRA examination procedure systematically questions every part of a process Or operation to discover qualitatively how deviations from normal operation can occur and whether further protective measures, altered operating procedures or design changes are required.

The examination procedure uses a full description of the process which will, almost invariably, include a P&ID or equivalent, and systematically questions every part of it to

(This work is licensed under a Creative Commons Attribution 4.0 International License.)

discover how deviations from the intention of the design can occur and determine whether these deviations can give rise to hazards.

The questioning is sequentially focused around a number of guide words which are derived from method study techniques. The guide words ensure that the questions posed to test the integrity of each part of the design will explore every conceivable way in which operation could deviate from the design intention.

Some of the causes may be so unlikely that the derived consequences will be rejected as not being meaningful. Some of the consequences may be trivial and need be considered no further. However, there may be some deviations with causes that are conceivable and consequences that arc potentially serious. The potential problems are then noted for remedial action. The immediate solution to a problem may not be obvious and could need further consideration either by a team member or perhaps a specialist.

All decisions taken must be recorded. Appendix 2 provides a recording example. Secretarial software may be used to assist in recording the HIRA, but it should not be considered as a replacement for an experienced chairperson and secretary.

The main advantage of this technique is its systematic thoroughness in failure case identification. The method may be used at the design stage, when plant alterations or extensions are to be made, or applied to an existing facility.

REFERENCES

[1] Andow, P., Guidance on HAZOP procedures for computer-controlled plants. UK Health and Safety Executive Contract Research Report No. 26/1991.

[2] Bullock, B.C. The development application of quantitative risk criteria for chemical processes. Fifth Chemical Process Hazard Symposium, I. Chem E., Manchester, April 1974.

[3] Chemical Industry Safety and Health Council of the Chemical Industries Association Ltd. A guide to Hazard and Operability Studies. 1977

[4] Dicken, A.N.A., The quantitative assessment of chlorine emission hazards, Chlorine Bicentennial Symposium 1974 (New York Chlorine Institute).

[5] Farmer, R.R., I. Chem E. Symposium Series No. 34, Major Loss Prevention in the Process Industries, 1971, p. 82.

[6] Gibson, S. B., "Reliability Engineering Applied to the Safety of New Projects", Chem. Engr., London, 306, 105 (1974).

[7] Hazard Analysis Course Notes, ICI Engineering (Australia).

[8] Health and Safety Executive, "Programmable System in Safety Related Applications", HSE, HMSO, London, 1987.

[9] Kletz, T. A., "Specifying and Designing Protective System". Loss Prevention, 6, 15 (1972).

[10] Kletz, T. A. (1986), "Hazop and Hazan", Institution of Chemical Engineers (UK).

[11] Knowlton, R.E., "An Introduction to Hazard and Operability Studies — A Guide Word Approach", Chemetics International Ltd., 1981.

[12] Lake, I. (1990) "HAZOP of Computer Based Systems", ICI Engineering (Australia).

[13] Lawley, H. G., Operability Studies and Hazard Analysis, Chem. Eng. Prog., April 1974.

[14] Lees, F.P. (1996), "Loss Prevention in the Process Industries" Vol 1, 2 and 3, Butterworths. Oil Industry Safety Directorate, (OISD)-STANDARD-118,167,105,154,244.

(This work is licensed under a Creative Commons Attribution 4.0 International License.)