

A Study on Emergency Management in Manufacturing Industry by Using Bow Tie Analysis

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Abstract: All organizations are vulnerable to unexpected or uncertain events that require them to plan for emergencies as part of their health and safety and overall management framework. While expert advice may be required, the generalist Occupational Health and Safety professional has a role in facilitating and monitoring the emergency planning and preparedness. This project involves the study on the emergency management in manufacturing industry. This study presents the analysis of the emergency preparedness and response arrangements in the industry that helps the organization to avert or minimize the impact during the emergency situations. The existing emergency response plan of the company is analysed based on which recommendations are provided in order to improve the preparations for potential and unexpected incidents at the workplace. The Bow-tie analysis gives a visual representation of the prevention and mitigation steps that are required in the workplace to eliminate or at least reduce the chances of accidents. All the probable accident scenarios that could exist around the hazard are summarized to determine its threats and consequences.

Key Words: — *Emergency Management, Risk, Incident, Bow-Tie Analysis.*

I. INTRODUCTION

An emergency can be defined as a serious, unexpected, and often dangerous situation that requires immediate action. Work place emergency refers to the event that occurs and endangers the people in and around the workplace and risks disrupting the operations by causing damage. Irrespective of the safety system developed, organizations need to prepare for all the possible emergencies so as to avoid or control the consequences that arises out of the emergency. Some emergency like fire, explosion, flood, etc., needs complete plant evacuation in which all the live equipment is turned off and the people inside the organization are moved to a safe place. Some emergency situations like medical emergency does not need complete plant evacuation as it only needs the victim and the equipment associated with the incident to be taken care of.

Emergency management plays a significant role in each and every organization as it acts as an integral part of its overall loss control programme.

It is necessary for the management to focus on effective management of an accident or incidents in order to minimize the losses to the people and property irrespective of whether they are inside or outside the facility. The important aspect in emergency management is to prevent by technical and organizational measures, the unintentional escape of hazardous materials out of the facility and minimize accidents and losses. Emergency planning demonstrates the commitment exhibited by the organization in providing a safe working environment to their employees and thereby increasing the organization's safety awareness. The main objective of emergency management plan is to ensure that everyone knows:

- What are the hazards and risk in the plant
- What and how to do in the event of an emergency; and
- Preparations for potential and unexpected incidents at the workplace.

The types of emergencies to plan for include fire, explosion, toxic releases, injuries and rescues due to any unplanned and unexpected events.

II. PROBLEM IDENTIFICATION

- It is necessary to ensure that the workplace is

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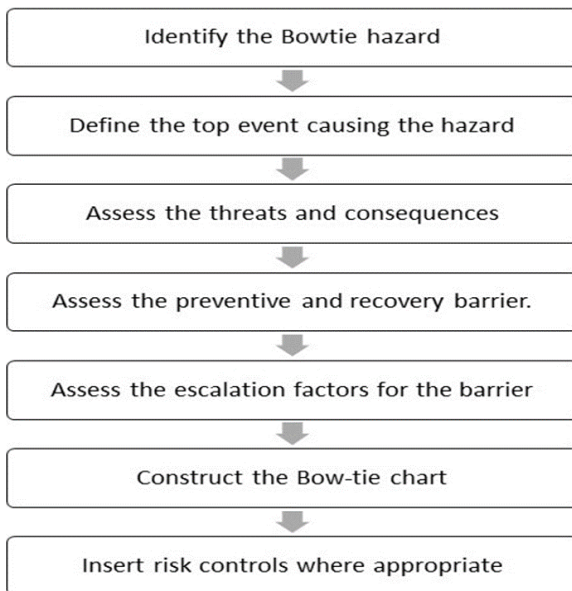
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prepared for the potential and unexpected incidents. It should be tailored to the worksite and must include information about all potential sources of emergencies in order to reduce injuries, protect the community and maintain business continuity.

- The emergency response preparedness was observed in
 - Workers carrying out the moulding process in the moulding equipment high risk activities like lifting, welding, chemical handling, etc.,
 - Workers carrying out in medium risk and low risk activities like loading and unloading of moulds and rubber components, manual handling, cleaning, etc.,
- Potential accidents that can occur while working on a moulding equipment includes, cut injury, caught in, heat burns, etc., For doing the analysis on emergency management pertaining to this activity, the main hazard, its causes and consequences are analysed.

III. METHODOLOGY



IV. EXPERIMENTAL SETUP AND PROCEDURE

It is necessary to ensure that the workplace is prepared for the potential and unexpected incidents. It should be tailored to the worksite and must include information about all potential

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V. BOW-TIE ANALYSIS

The Bowtie method is a risk evaluation method that can be used to analyse and demonstrate causal relationships in high-risk scenarios. The method takes its name from the shape of the diagram that you create, which looks like a men’s bowtie. A Bowtie diagram does two things. First of all, a Bowtie gives a visual summary of all plausible accident scenarios that could exist around a certain Hazard. Second, by identifying control measures the Bowtie display what a company does to control those scenarios. Bow-Tie diagrams depict the relationship between Sources of risk, Controls, Escalation Factors, Events, and Consequences. Bow tie analysis is a hazard analysis technique which is combination of fault tree analysis (FTA) and event tree analysis (ETA). Fault tree analysis (FTA) is identifying basic events that can lead to an accident event, whereas Event tree analysis (ETA) is identifying the event sequences from initiating events to accident scenarios.

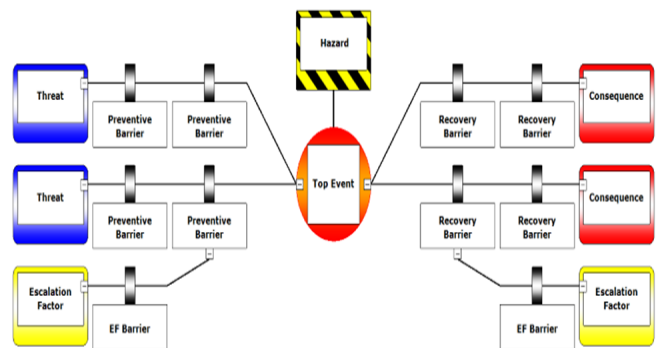


Fig.1. Bow-Tie model of risk

VI. BENEFITS OF BOW-TIE ANALYSIS

- Highly effective for initial Process Hazard Analysis.
- Ensures identification of high probability-high consequence events.
- Combined application of a high-level fault/event trees.
- Representation of the causes of a hazardous scenario event, likely outcomes, and the measures in place to prevent, mitigate, or control hazards.
- Existing safeguards (barriers) identified and evaluated.
- Typical cause scenarios identified and depicted on the pre-event side (left side) of the bow-tie diagram.
- Credible consequences and scenario outcomes are depicted on the post-event side (right side) of the diagram.
- Associated barrier safeguards included.

VII. CONCLUSION

Though emergency situations are more likely to occur especially the medical emergencies while working on the machineries and equipment. Preventive measures can be taken in order to avoid the occurrence of uncertain situations. Recovery measures also play a crucial role in reducing the impact of hazardous event. Each and every hazard that exists in the workplace must be identified and control measures must be put in place to protect the people and property.

Instruction, Information, Training, and Supervision on safe work procedure must be increased through toolbox briefing, refresher trainings, third party trainings, etc., Use of personal protective equipment must be closely monitored and stringent actions need to be taken on the workers in case of repeated violation of safe work procedures.

Permit to Work system must be implemented for non-routine activities in the workplace like maintenance, construction, etc., so as to ensure that the safety arrangements are in place and to ensure that qualified people are performing the maintenance activities under appropriate supervision and knowledge of the management.

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