

Role of Individual factors in effective Safety Management System of Oil & Gas Industries

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Abstract - Oil and Gas Sector plays key role in influencing growth of the economy. India is arising economy in the world with rapid infrastructure growth seen all around specifically in Oil & Gas Sector. At the same time, Oil and Gas Sector poses increased risk of fires, explosions, environmental pollution etc. resulting in to threat to human lives and flora fauna at large due to inherent hazardous processes and properties of chemicals, hydrocarbons etc.

Safety Management System (SMS) has been established in Oil & Gas Organizations to identify the hazards, evaluate the risks involved and to mitigate or control the risks by implementing effective Loss Control measures. There are various factors which influence the effectiveness of Safety Management System like Organizational, Environmental & Individual Factors. Paper identifies role of "Individual" factors in an effective Safety Management System. It is needless to mention that individuals are interface between machine or equipment and various operations at work place.

Keywords:- Safety Management System, Accident Causation

1. INTRODUCTION

Oil and Gas Sector plays a pivotal role in influencing important spheres of the economy. India is arising economy in the world with rapid infrastructure growth seen all around, specifically in Oil & Gas Sector. Increasing Oil & Gas infrastructure also poses increased risk of fires, explosions, environmental pollution etc. resulting in to threat to human lives at large, flora & fauna. Organizations have set up "Safety Management System (SMS)" for systematic identification of the hazards associated with Construction, Operation and Maintenance activities and to provide mitigation measures so as to control the hazards and bring down risks to acceptable level.

A SMS provides a systematic way to identify hazards and control risks while maintaining assurance that these risk controls are effective. It is a systematic, explicit and comprehensive process for managing operational risks and all safety related issues in the organization.

2. OBJECTIVE

The objective of this paper is to identify

- a) Development of Safety Management System
- b) Contribution of Individual Factors like human behaviour, knowledge, skill, competency etc. to drive the implementation of SMS in workplace at large Oil & Gas Installation in India.

3. METHODOLOGY

Various technical journals and articles on "Safety Management System" and related topics have been referred, besides referring various Standards, Guidelines and other related literature.

4. FINDINGS

a) Development of Safety Management System

The concept of "Safety Management System" is not new to the world. It started early in nineteenth century with various Accident Causation Theories. Accident causation models were originally developed in order to assist people who had to investigate accidents, so that such accidents could be investigated effectively. One of the causation model was represented by Mr. Henrich in the year 1931, in which he suggested (based on his Domino Theory) that three corrective action sequence (The three "E"s) are required to be taken to prevent the accident i.e Engineering (Control Hazards through product design or process change), Education (Train workers regarding all facets of safety and impose on management that attention to safety pay off) & Enforcement (Ensure that internal and external rules, regulations and standard operating procedures are followed by workers as well as management). Further, Mr. Frank E. Bird refined Heinrich's pyramid with his study of large number of accidents.

The requirement for organisations to develop Safety Management System grew out of the result of a number of disasters mainly Flixborough Accident (1974), Seveso Disaster (1976) & Piper Alpha (1988) respectively. During the investigations of these accidents issues related to modification control, training, adherence to permit to work system, proper isolation of plant for maintenance, limiting inventory of installation and pipelines, fire & explosion Protection, evacuation and escape etc. evolved, which lead to requirement of "Safety Management System".

First SMS applications were based on the Occupational Health and Safety Management System (BS 8800) and the Dutch Safety Checklist for Contractors (SCC) standard. BS 8800 was replaced with the international OHSAS specifications in year 2000. The Occupational Health and Safety Assessment Series specifications OHSAS 18001 support the assessment and certification of the management systems of organisations. OHSAS specifies the requirements such as OH&S Policy,

Planning, Implementation & Operation, Checking & Corrective Action, Management Review & Continual Improvement etc. International Labour Organisation (ILO) also published some guidelines on occupational health and safety systems (ILO-OHS 2001). Like any other Management System, Safety Management System need to take care of basic components like Policy, Organizing, Planning and implementation, Evaluation, & Action for improvement.

Meanwhile Oil Industry Safety Directorate (OISD), a technical group under Ministry of Petroleum & Natural Gas, Government of India brought one Standard “Guidelines on Safety Management System in Petroleum Industry” in 2001, covering 19 elements on various safety aspects. The aim of guidelines was to establish the System for managing all safety issues covering all aspects of plant and facilities related to personnel, equipment, material and environment. Objective of developing such a system was to standardise the safe working procedures which should continue to be followed by one and all unless a change in the system is duly authorised by a competent person.

By looking in to the details of any Safety Management System, it can be easily identified that three contributory factors i.e Organizational (Latent Factor), Environmental/Task (Latent/Intervening Factor) and Individual (Active Factor) factors influence the failure or success of Safety Management System of any organization. These factors were duly addressed through a comprehensive mode of accident causation theory presented by Mr. James Reason (1990) who introduced the concept of “organizational error”. The Organizational Failures (Latent Failure) lead to accident and incident, penetrating system’s defense and barriers. Individual Failures (Active Failure) are unsafe acts (slips, lapses, mistakes, procedural violations etc.) committed by people, who are in direct contact with the system.

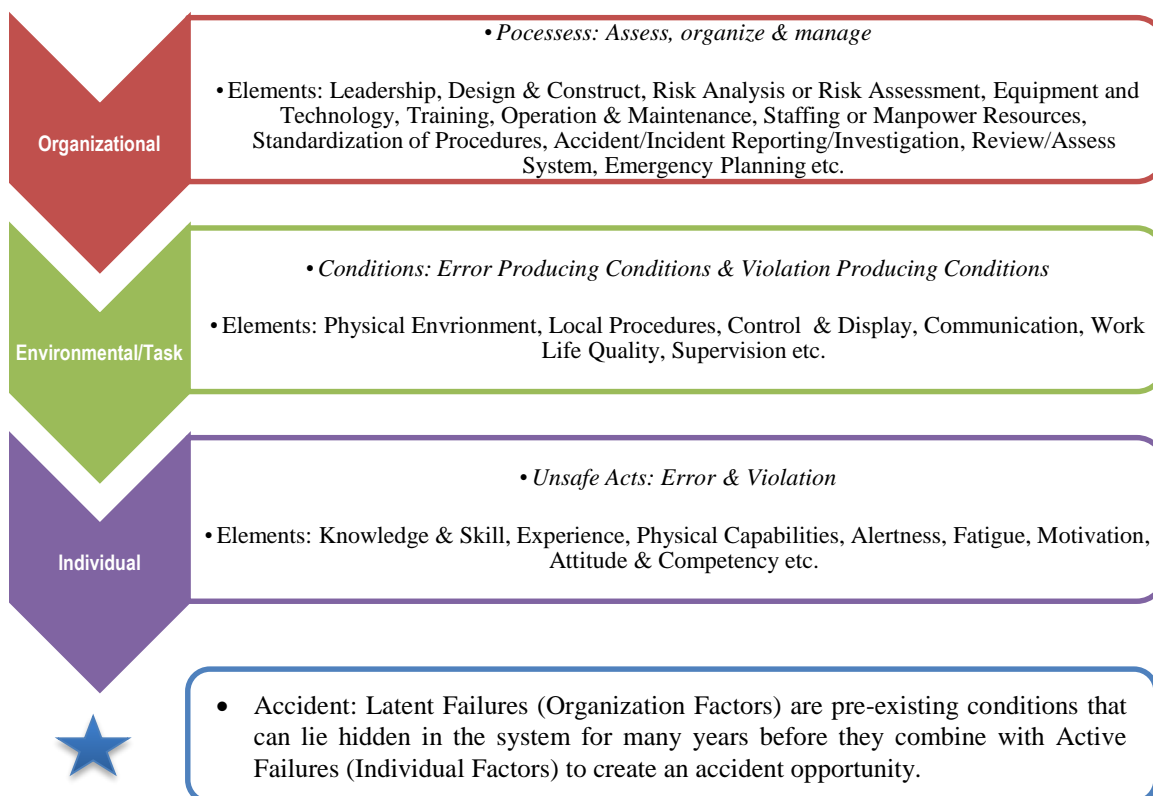


Figure-1

b) Individual Factors & Safety Management System

“Safety Management System” goes deeply (as an integral part) in the thinking and strategies of the Operation & Maintenance planners of most of the Oil & Gas organizations in India. Major incidents which occurred at Jaipur, Hazira, Vishakhapatnam, Tatipaka etc. in Oil & Gas Industries further suggested reviewing the established Safety Management System for increasing effectiveness. In spite of best of system, procedures, machines, equipment etc. incidents do happen.

The ‘culture’ of an organisation is reflection of the attitudes and beliefs of people who matter most. Organization Culture is visible in company’s core business processes including decision making at the highest level. These cultural factors take a long time to develop, they are slow to change and their influence is widespread and persuasive. High level decisions are shaped by external economic and political factors and often represent the starting point for various success/failure pathways.

The efficiency and reliability of human performance is affected by environmental conditions in a particular work context. Wherever workers are involved in the core business of the organisation, they are often in close proximity to the local hazards. The negative consequences of the top-level decisions get transmitted along various departmental and organisational pathways to the work site, creating work sites which promote the commission of unsafe acts. Fortunately, only few unsafe acts will penetrate the defences to bring about damaging consequences. Local working conditions can be divided into two interacting groups: those relating to the task and those relating to people’s mental and physical states.

Unsafe acts can be divided into errors and violations, where errors represent the activities of individuals who fail to achieve their intended outcome and violations refer to the non-compliance to the safety rules and regulations. Let us look at the Table-1 in this context.

Reference	Inference
Heinrich Domino Theory	88% of all industrial accidents are caused primarily due to unsafe acts
DuPont, Wilmington	96% of injuries and illnesses are caused by unsafe acts, 4% other Causes
Behavioral Science Technology (BST)	80-95% of all accidents are caused by unsafe behaviour
Quality Safety Edge	76% of all accidents are caused by behavior, 20% by behavior and conditions, 4% caused by conditions Only

Table - 1

Referring Table 1, it can be summarized that more than 85% of accidents occur due to unsafe acts. This belief further gets validated if we refer to a report of OISD on Analysis of Major Incident in Oil & Gas Industry, Period 2004-2009 published in August 2009. Report summarized that 60% (Figure 3) of incidents in Oil & Gas installations in India were caused by Human Error leading to 161 fatalities (Figure 2) in during years 2004-2009.

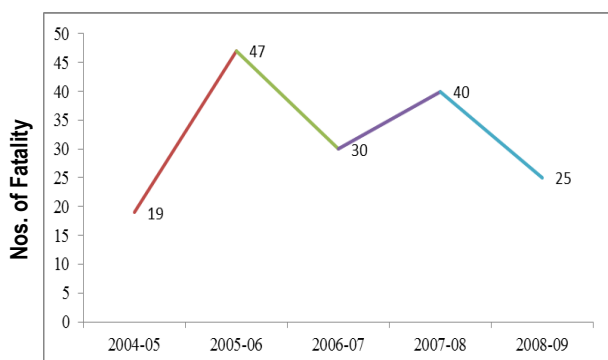


Figure-2

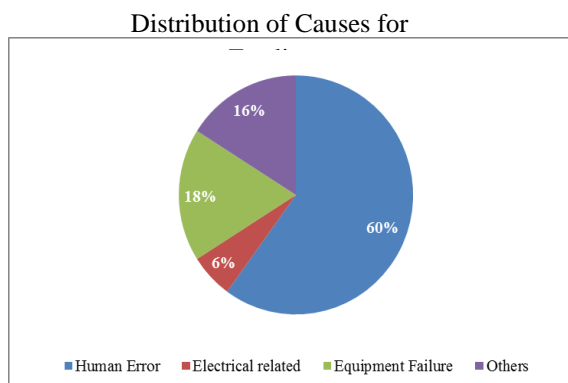


Figure-3

Further, the incident statistics for the last three years including year 2014-15 were presented by OISD to Safety Council in last meeting. The analysis of the incidents reveals the disturbing trend that “disregard to the extant systems and procedures” & “inappropriate supervision” continues to be major cause of incidents across the Industry. More than 80% of such incidents contributed by “individual” factors include non-adherence to SOPs, non-following work permit system, slips, trips & fall etc., which could be avoided by ensuring strict adherence to SOPs and proper supervision.

5. RECOMMENDATIONS & CONCLUSION

Attaining safe work behaviour at site is a challenge. There is no substitute to proper supervision, there is no substitute to the habit of strict adherence to SOPs and similarly, there is no substitute to safe behaviour at work. Above inference can be easily drawn by analysing the data before us, as placed in the Table-1 on pre-page. However, there is a need to further research whether “individual factors” play such a major role in causing accidents, as compared to organizational and environmental factors, as depicted in the data table on pre-page.

List of Abbreviations used:

SMS	: Safety Management System
OHSAS	: Occupational Health & Safety Assessment Series
ILO	: International Labour Organization
OISD	: Oil Industry Safety Directorate
OHS	: Occupational Health Safety
SOP	: Standard Operating Procedure
BST	: Behaviour Science Technology

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