

# Process Safety Management Gap Audit Reports in Steel Industry

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**Abstract:-** Steel is a major industry .It is based on the raw material to steel component. In this process various process hazards likes Spillage of molten metal, Leakages of hazardous & flammable gases & all other hazards, burn, cut & injury present in the overall steel manufacturing process. Indian Steel industry one of the major industry in India SAIL, Tata Steel, Jindal Steel, The main object to this work to process safety management gap find in the steel industry to prevent such major incident likes- October 09.10.2018 at least nine persons were killed and 14 injured in a major fire in Steel authority of India Bhilai operated by SAIL on Tuesday. The death toll is likely to increase as many of the injured are suffering from very high degree of burn. However, unofficial estimates suggest that 14 are dead and they are regular SAIL employees mostly from energy and fire department. “Fire occurred in gas pipe line during a scheduled maintenance job Process. So process Safety management compliance should have this type accident prevent in the future for the Steel manufacturing unit also with help of PSM in steel industry. Process means a series of actions to achieve and flow of gases & chemicals. Flow of fluid takes one place to another its process in the industries may combine of materials, as initial or intermediate inputs, or additives; actions like carrying, distillation, placing, mixing, Separation involving in reaction, changes in compositions; formations in particular shape/size of materials. Accident occurred, taking heavy toll of human life, Environment health and assets. Only one case of Bhopal tragedy in India in 3/12/ 1984, killed 2000 people in single night, crippling 2 lakh population, because of release of large quantity of deadly Methyl isocyanate (MIC) gas from an abandoned plant of insecticide product Process safety starts with design-friendly plants which can withstand human error and equipment failure without serious effects on Fire safety, environment and efficiency. Process design analysis is very much important to identify the risks in the project. It involves activities like hazard analysis, risk analysis, guidelines for estimating losses and project review and procedures. Process safety identifies risk and control measures to reduce or eliminate the risks to avoid the unwanted events. Employers must acquire written process safety information to conduct process hazard

analysis in order to identify and understand the hazards posed by the processes, the highly hazardous Gases & chemicals used or produced by the process, the Engineering technology of the process, and the equipment used in the process. PSM used for- Establish a safety culture in the premises. Establish Safety management, Emergency management’s leadership & commitment; Ensure operating excellence through operational discipline. The application of process safety management identifies process hazards to be understood & controlled so that process related accident and incidents can be prevented.

In a Steel process Industry, the following elements of Process Safety Management are important which are implemented to achieve process control through hazard identification, risk analysis and assessment, risk mitigation, hazard management control and emergency action plan.

**Keywords:-** Mechanical Integrity, Process Safety Information, Permit system, Emergency management system. Safety Rating System.

## I. INTRODUCTION

In recent year’s use of steel in our infrastructure there have been some accidents occurred that have not been followed by the process safety management elements in the steel industry. So Process Safety Management gap audit conducted in the Jindal steel plant benefits of PSM gap audit is so many because PSM is the the proactive and systematic identification, evaluation, and mitigation or prevention of chemical releases that could occur as a result of failures in process, procedures, or equipment is called Process Safety Management.

GAP AUDIT is the comparison of actual performance with potential performance. If a company or organization does not make the best use of current resources, or forgoes investment in capital or technology, it may produce or perform below its potential. During a *GAP AUDIT*, key process owner or project stakeholders provided evidence that they have met the requirements set forth in the specification or standard.

## PSM Elements Methodology-



Fig 1:- PSM Elements

Several major disasters such as Flixborough, Seveso and Bhopal which strike the nuclear, petrochemical and transport industries have been an eye opener that triggers the public concern over the management of hazardous activities. Hale & Hovden (1998) mentioned that the irony of those disasters was that it took place in high technologies industries which people had believed to be appropriately managed by well developed, high bureaucratic safety systems. Investigations result showed that the root causes implicated more than technical or human failures. Only till up to 1980's that we had not considered poor

management of uncontrolled changed as a root cause of such accidents. One of the establish standards that emphasise the above issue is the management of change element of Process Safety Management (PSM) 29 CFR 1910.119(l). This standard specified by Occupational Safety and Health Administration (OSHA) in the code of federal regulations Chapter 29 section 1910.119 covers the requirements for the management of hazard associated with the decision on whether to allow a change to be made, necessary risk control and follow up measures.



Fig 2:- Hazards in molten metal at Steel Industry

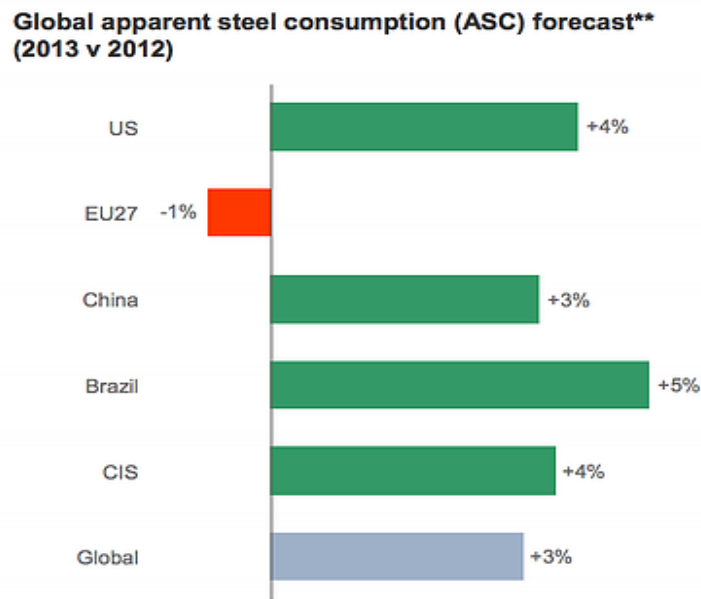


Fig 3:- Global Apparent Steel Consumption (ASC) Forecast

## II. METHODOLOGY

In Stainless steel plant the ABB'S PHR METHODOLOGY used for carrying out the PSM Gap Audit is given below at Jindal Stainless steel plant:

- Study and analyses preliminary information provided.
- Opening Meeting with concerned key personnel at site.
- Discussion with key personnel in group and individually as

required to know their views, suggestions or to verify existence of the systems/procedures.

- Study important documents & records related to process safety.

During the visit & documents inspection we compare the OSHA process safety management check sheet for gap finding is given below

Question		Exceptions	Evidence / Comments
		Found?	
A.	Applicability		
A.1.	Does the OSHA PSM regulation apply:		
A.1.i	A process which involves a chemical at or above the specified threshold quantities (see 29 CFR 1910.119 Appendix A)		
A.1.ii	A process which involves a flammable liquid or gas (as defined in 1910.1200(c) of this part) on site in one location, in a quantity of 10,000 pounds (4535.9 kg) or more except for:		
	(A) Hydrocarbon fuels used solely for workplace consumption as a fuel (e.g., propane used for comfort heating, gasoline for vehicle refueling), if such fuels are not a part of a process containing another highly hazardous chemical covered by this standard;		

Table 1:- PSM audit check sheet 29 CFR 1910.

### III. RESULT

Applying PSM process safety elements during the audit in the Steel industry Gap % observed in the element wise process safety managements during the site visiting, documentation review process .Mechanical integrity and Pres startup safety review found in very low gap % is 30% & Total four PSM( Process safety elements) MOC, Compliance audit, Trade secret and PHA observed in 100% highest gap is given below in the table & total average gap outcome in industry withrefrenceto PSM is 70.71% according to risk category industry marked in very high risk mentioned in the red color (Apx data) .

Sr. NO	Description of Elements	PSM Elements	Target (%)	Actual (%)	Gap (%)
1	Employee Participation	PSME 1	100	30	70
2	Process Safety Information	PSME 2	100	50	50
3	Process Hazard Analysis(PHA)	PSME 3	100	0	100
4	Operating Procedures	PSME 4	100	30	70
5	Training	PSME 5	100	30	70
6	Contractor Safety	PSME 6	100	30	70
7	Pre-Start-up Safety Review	PSME 7	100	70	30
8	Mechanical Integrity	PSME 8	100	70	30
9	Hot Work Permit	PSME 9	100	60	40
10	Management of Change(MOC)	PSME 10	100	0	100
11	Incident Investigation	PSME 11	100	20	80
12	Emergency Planning and Response	PSME 12	100	20	80
13	Compliance Audits	PSME 13	100	0	100
14	Trade Secret	PSME 14	100	0	100

Table 2:- Element wise process Safety Management Gap %

PSM Average Gap% =  $\frac{\text{PSME 1} + \text{PSME 2} + \dots + \text{PSM 14}}{14}$

14

Over All PSM Gap% = 70.71%

PSM Gap%	Risk Category	Color
0-30%	Low	Green
30-60%	Medium	Orange
60-100%	High	Red

Table 3:- Risk Category

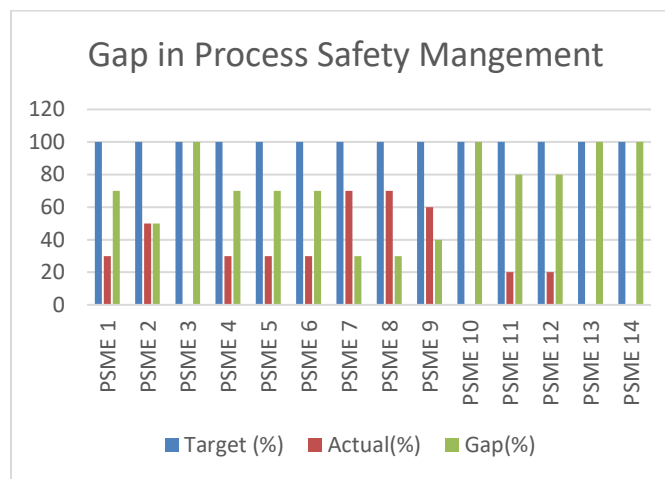


Fig 4:- Gap in Process Safety Mangement

#### IV. CONCLUSION

In this study the gap assessment conducted in steel industry because steel industry is also type of process industry. There are several benefits of process safety management at steel industry viz. ensures safe workplace for workers, reduces Risk to nearby community, reduces Risk to adverse environment impact, increases assets reliability with reduced downtime & losses, ensures high score in International SRS provides a powerful Hazards & risk management tool, reduces Insurance premium, integrates with existing Quality, EHS System, facilitates structured approach of business, management with best controls, etc. but in India PSM is not mandatory or statutory but instead of PSM we have similar regulation likes Manufacturing storages and import of hazardous chemical rules 1989 under the Environment rules & The chemical accident (Emergency planning preparedness & response rules-1996) So there are many rules and regulation available in India related to PSM. Only one OSHA PSM provides compliance in India all PSM related regulation which is very easy & less confusion so future way PSM is the best way to prevent the accident from highly hazardous chemical & steel industry.

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