Sustainable Quality of Safety in Safety Management System with Kaizen and Six Sigma

Mayank Bundele, Vipul Upadhayay, Yogesh P. Ladhe

Abstract—This paper describes the most important factor in the industries which need to be paid attention very seriously is the accident which are taking place during the production on the shop floor where the employees have to work on different kinds of machines. Major thing to look up is that in spite of the application of a wide variety of safeguarding measures, many accidents in the industries still happen today. So with this many people have come with an increasing number of technical solutions. One of the best known and widely accepted technical solutions concerns the use of Safety Management System (SMS). In this Safety Management System for better quality of safety Kaizen and Six Sigma Strategies are involved.

Index Terms— Quality Management, Kaizen, Safety Management, Safety Management System, Six Sigma, Sustainable Quality.

1 INTRODUCTION

Safety Management System (SMS) is a term used to refer a comprehensive business management system designed to manage safety elements in the workplace. A safety management system can be created fit any business type and/or industry sector. SMS provides a systematic way to identify hazards and control risks while maintaining assurance that these risk controls are effective. It is a business-like approach to safety. It is a systematic, explicit and comprehensive process for managing safety risks. As with all management systems, a safety management system provides for goal setting, planning, and measuring performance. A safety management system is woven into the fabric of an organization. It becomes part of the culture, the way people do their jobs.

In this paper we are describing A Safety Management System with Kaizen and Six Sigma Strategies for improving quality of safety management systems. With this safety management we want to prevent accidents before it appear and if it appears so get some instant remedy for accident for stop more and more loss of Human, Capital, Machines, System, and Inventory.

Kaizen a Japanese philosophy or practices that focus upon continuous improvement of processes in manufacturing, engineering, and business management. It has been applied in healthcare, psychotherapy, life-coaching, government, banking, and other industries. When used in the business sense and applied to the workplace, kaizen refers to activities that continually improve all functions, and involves all employees from the CEO to the assembly line workers. It also applies to processes, such as purchasing and logistics. It is a strategy which can be continuously improve the Safety Management System and continuous development is the key of sustainable safety.

Six Sigma is a set of tools and techniques/strategies for process improvement. Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defect and error in processes and minimizing variability in manufacturing and business processes. It uses a set of quality management methods, including statistical methods, and creates a special infrastructure of people within the organization ("Champions", "Black Belts", "Green Belts", "Yellow Belts", etc.) who are experts in the methods. Each Six Sigma project carried out within an organization follows a defined sequence of steps and has quantified value targets, for example; process cycle time reduction, customer satisfaction, reduction in pollution, cost reduction and/or profit increase.

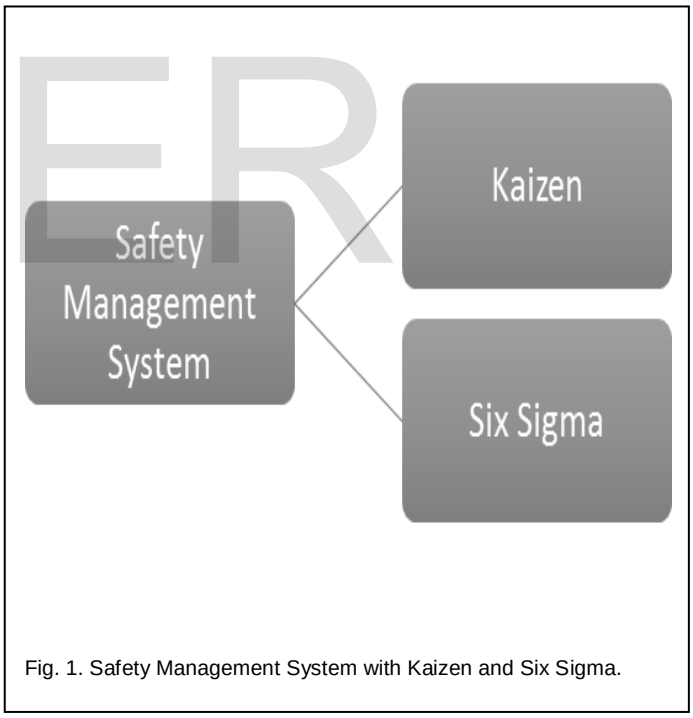

Fig. 1. Safety Management System with Kaizen and Six Sigma.

The term Six Sigma originated from terminology associated

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with manufacturing, specifically terms associated with statistical modelling of manufacturing processes. The maturity of a manufacturing process can be described by a sigma rating indicating its yield or the percentage of defect-free products it creates. A six sigma process is one in which 99.99966% of the products manufactured are statistically expected to be free of defects (3.4 defects per million).

This Safety Management System can prevent the accidents and if accident will occur the system will take immediate action on it. This system can able to sustain safety in overall processes. System can reduces the losses during processes like Human loss, Machine loss, Capital Loss, Inventory loss and System losses. This system can find the sustainable safety in overall cycle.

2 METHODOLOGY

Major thing to look up is that in spite of the application of a wide variety of safeguarding measures, many accidents in the industries still happen today. So with this many people have come with an increasing number of technical solutions. Kaizen development for continues improvement and Six Sigma for rectify errors in safety management. This overall cycle will take place in three phases.

- Human Behavior
- Follow ISO Standards
- Technical Development

Fig. 2. Three phases of this Safety management System Safety Management System with Kaizen and Six Sigma.

In all three phases the Kaizen and Six Sigma will implant on the Human Behavior and Technical Development Phases whereas ISO standards cannot be change it will the same as International Organization for Standardization drive all the standards. So Kaizen and Six Sigma Strategies can be apply on human Behavior and Technical development phases.

- Human Behaviour (Continuous Improvement)
  - Knowledge
  - Training
  - Awake
  - Aware
  - Utilize Instruments

- Follow ISO Standards
  - Follow Indian Standards Organisation

- Technological Development
  - Safety of Inventory
  - Safety of Machines
  - Safety of Workers
  - Safety of Capital

3 HUMAN BEHAVIOUR (PHASE 1)

The phase 1 can be associated with Human Behaviour. In safety Human Behaviour can be changed by Kaizen. By the continuous improvement safety level in the industry will increase day by day.

Steps to change in Human Behaviour

- Knowledge
- Training
- Awake
- Aware
- Utilize Instruments

Give the knowledge to worker of the particular operation he has to work for. First of all the all the details of the operation and previous and predictable data should be explained in detailed to the workers and it's on only one time process it must be continued time by time.

Training is the most important factor for the worker. It will help them to how to assist a particular job with safety not only themselves but also for surrounding.

Awaking the workers for their responsibilities with respect to company and their job. If they will understand as his work as a responsibility they will automatically work with efficiently and with safety also.

Awareness is the another factor in safety which change the dimension of the safety if a worker is aware between operations and he knows how to be alert in between duty hours so accident will not take place in the industries.

Worker need to be get knowledgeable and get trained for about which instrument he is using if he don't know about the instrument which he is using can be permanent harm to himself, machine and instrument itself.

This five steps can be improve by the Kaizen time bye time and continuously improvement and training session can be transform the safety of the industries.

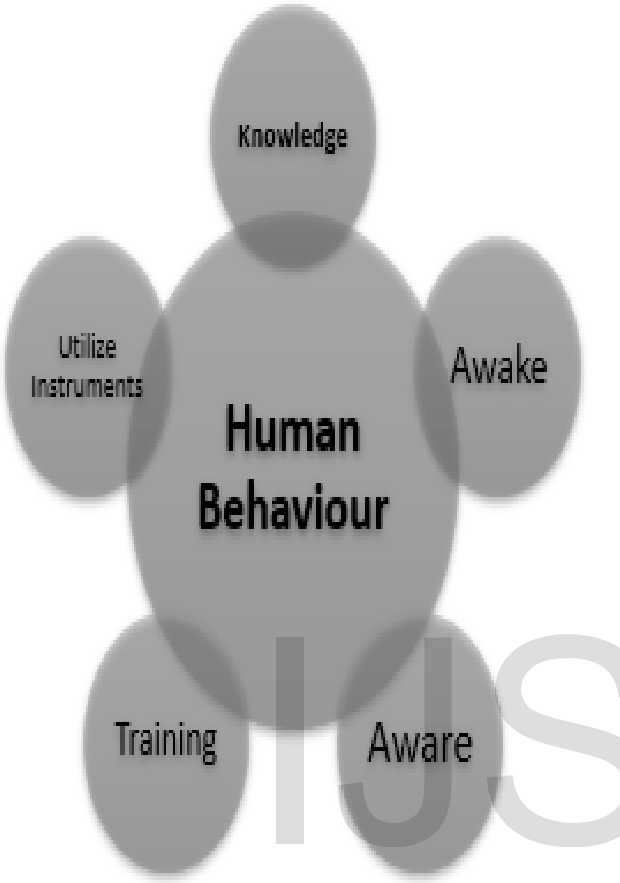

Fig. 3. Change in Human Behaviour using Kaizen Safety Management System with Kaizen and Six Sigma.

4 Follow ISO Standards (Phase 2)

The International Organization for Standardization known as ISO, is an international standard-setting body composed of representatives from various national standards organizations. ISO International Standards ensure that products and services are safe, reliable and of good quality. For business, they are strategic tools that reduce costs by minimizing waste and errors and increasing productivity. They help companies to access new markets, level the playing field for developing countries and facilitate free and fair global trade. And it cannot be changed whereas it will follow as it is given from the International Organization for Standardization.

Some ISO Standards which company and works have to follow.

ISO 9000 - Quality management

There are many standards in the ISO 9000 family, including:

- ISO 9001:2008 - sets out the requirements of a quality management system
- ISO 9000:2005 - covers the basic concepts and language
- ISO 9004:2009 - focuses on how to make a quality management system more efficient and effective
- ISO 19011:2011 - sets out guidance on internal and external audits of quality management systems.

ISO 31000 - Risk management

- ISO 31000:2009, *Risk management – Principles and guidelines*, provides principles, framework and a process for managing risk.

Fig. 4. Safety Management System with ISO Standards

5 Technical Development (Phase 3)

Today Six Sigma quality community includes certification that incorporates formal instruction, performance standards, and applying a wide range of analytical problem-solving tools such as Pareto charts, process maps and fishbone diagrams. Its mastery borrows martial arts vernacular (e.g., black belt, sensei) to define levels of understanding and performance. In much the same way quality management made significant strides during the 1980s, industrial safety is poised for its own transformation.

This provides an actionable approach to how a zero injury culture can be driven by adopting the same tools and tactics of product quality's Six Sigma methodology.

Applying Six Sigma thinking to safety has tremendous possibility and potential. Lean Six Sigma provides a framework for

integrating safety into operations.

In Six Sigma operations, safety is addressed in tactical as well as strategic planning. The organizational systems that drive efficiency and quality are applied to the safety process. Safety goals are aligned with business objectives, thereby creating a linkage between resource needs and allocation. Six Sigma is the evolution of statistical quality improvement processes that have been used extensively to improve manufacturing and other process-related industries.

5.1DESIGN FOR SIX SIGMA

Design for Six Sigma (**DFSS**) is a separate and emerging business-process management methodology related to traditional Sigma. While the tools and order used in Six Sigma require a process to be in place and functioning, DFSS has the objective of determining the needs of customers and the business, and driving those needs into the product solution so created. DFSS is relevant to the complex system/product synthesis phase, especially in the context of unprecedented system development. It is process generation in contrast with process improvement.

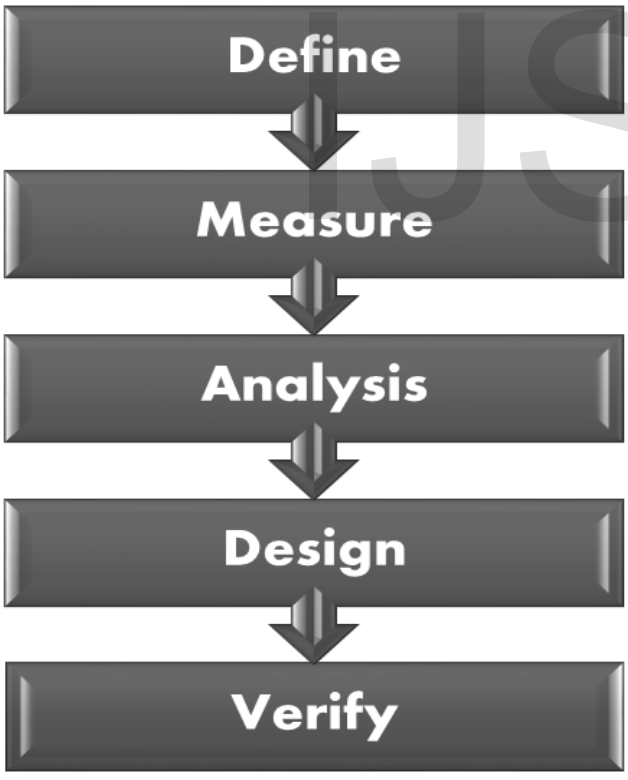

Fig. 5. Design for Six Sigma and its processes

DMADV, define – measure – analyze – design – verify, is sometimes synonymously referred to as DFSS. The traditional DMAIC (define – measure – analyze – improve – Control) Six Sigma process, as it is usually practiced, which is focused on evolutionary and continuous improvement manufacturing or service process development, usually occurs after initial system or product design and development have been largely completed.

The Six Sigma process calculates to 3.4 defects per million opportunities. Needless to say, that is near perfect execution of a process. Although not often used in the safety arena to full potential, Six Sigma tools can help produce significant and sustainable improvements in safety performance, injury reduction and associated pain.

In this safety management system we are using the Six Sigma as Safety Prevention strategy. We are using Six Sigma as a Strategy in Safety Management System which will identify the error and rectify the error this strategy will try to safe processing and it will try to conduct the process as without any kind of failure. And if in any case accident will occur so system will try to stop very instantly.

Technological Development Essentials Areas

- Safety of Inventory
- Safety of Machines
- Safety of workers
- Safety of Systems

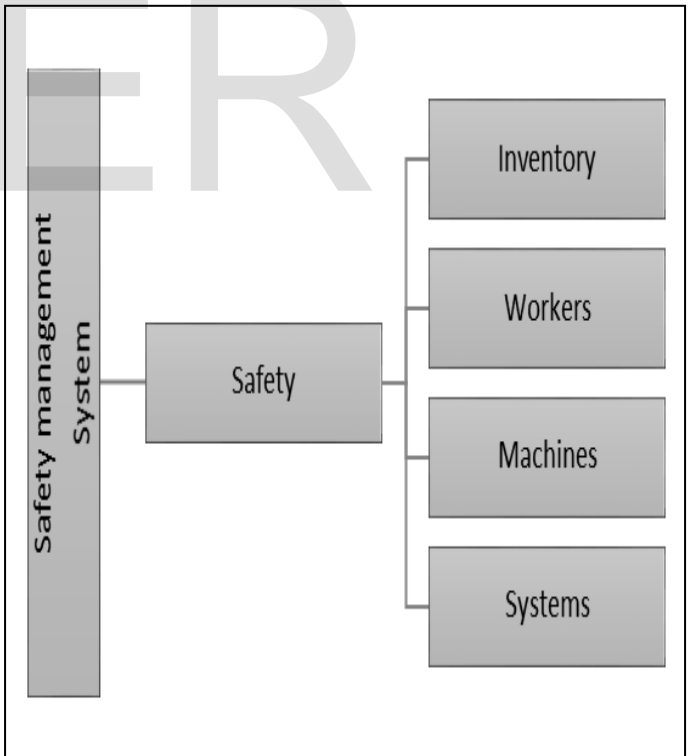

Fig. 6. Technical Development in Safety Management System

5.2SAFTEY OF INVENTORY

The role of the inventory in the industries are going more and more expensive if any kind of accident can damage the inven-

tory so it will be a big loss and if in any case inventory are stolen it will be big loss for the company.

To prevent this kind of incidents technology must be develop which can be identify the person by using camera which wearing company`s Identity Card and if the person is not wearing the Identity Card so the technology active the alarm system. It can save inventory from being stolen.

5.3 Saftey of Machines

Safety of Machines is another area in which technological improvement must take place. Machines are most important assets of the company damaged in it and accidents of machines can be transform company`s profit into loss. Harvey machinery should be mounted with sensors to avoid accidents.

Examples: Crane, Bulldozer, Roller, AVG, etc. So sensors are Stop the machines when sensor will identify another person and another machine.

5.4 Saftey of Workers

Workers are backbone of any industry so safety of workers play an important role in technological development. With this safety system accident will be stop before it occur in case of accident machine must be shut off / down itself immediately after listening workers voice a Sound frequency system may be developed. The group of sensors can identify the Shouting frequency of worker and stop that machine.

Development Needed

- A Sound Frequency System which can stop machine by recognize workers Voice Frequency.
- An Alternate Single button can be mounted which can shut off machine by single press.

5.5 Saftey of Systems

A Safety System must be develop in such a manner which are involved in Anti-fire system, Anti-Earth quake system, Electricity system to avoiding any kind of electric accidents, Fire accidents and A system indicates you before Earth-Quake.

Development Needed

- Anti-Fire System
- Anti-Earthquake System
- Electricity System

In the field of safety, a regular and continuous improvement a department should be build up. The RND (research and development) program should be continuously held on.

6 Conclusion

This strategy belongs to sustainability of safety with integration of safety management system and the strategy kaizen will lead to a sustainability of the systems this particular model will rectify the previous safety problems and it will upgrade a new safety model according to kaizen and the second phase of this strategy belongs to six sigma which will generate efficiency in production. This strategy can define new and the most efficient model of sustainability in safety management system with kaizen and six sigma.

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