

REVIEW PAPER ON IMPLEMENTATION OF 5S IN VARIOUS MANUFACTURING INDUSTRIES

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ABSTRACT

The purpose of this paper is to capture the status of implementation of 5S in various manufacturing industries and to help small scale manufacturing organization to become more productive and more efficient. The methodology of this review paper is to identifying a different techniques using for implementation of 5S in various industries like ceramic, automotive, bio-mass, food industry as well as in storage room, laboratories, business organization and many others.

The literature revealed that: Very few work was undertaken on the implementation of 5S in various industries like chemical, forging, moulding, casting, polymers etc. and service sectors like hospitals, restaurants, bank, government offices etc. A 6S as safety also one of the important element in a manufacturing industries in order to enhance human capabilities and productivity. This literature provide value to students, researcher and practitioners of 5S by providing insight into the implementation of 5S in various manufacturing industries and helps them to achieve a successful implementation in their work.

Keywords- 5S, Manufacturing Industry, Efficiency, Productivity, Quality Improvement, Reduction in Time, Waste Elimination etc.

1 Introduction

5S Methodology is one of the basic and the most important tool to implement Lean Manufacturing. It is a system to regulate the work flow by organizing the workplace, thus supporting the culture of continuous improvement (Raut², 2017). 5S has been introduced in Japan essentially in the manufacturing industries and service sectors. This literature aims to review previous studies about the benefits of 5S implementation and its efficiency in organizations. Indian industries are informed about quality improvement requirements, although disciplined approach is not yet in place and improvement efforts are not enough to remove weakness in quality. The study concludes that, 5S can support the objectives of organization to achieve continuous improvement in performance and productivity (Ghodrati A. , 2017). At the last barriers in 5S implementation are underlined.

This paper presents the discussion of implementation of 5S in manufacturing industries and assesses the success of 5S through various performance assessment parameters. In this paper, the literature on 5S research is collected and an inclusive review of these literatures is presented. A special attention is given to review the literature which has discussed about the implementation of 5S in manufacturing sector and performance access after the 5S implementation. This paper is organized into various sections. This paper covers the following: the research methodology, classification framework, implementation of 5S in manufacturing articles is analysed in different perspectives and concluding remarks which cover significant findings, gap analysis and limitation of research. This paper will be beneficial to researchers and practitioners, who are really interested in the implementation of 5S in the manufacturing industry. This will help to encourage further research in this area.

2. What is 5S?

5S Methodology Is One Of The Basic And The Most Important Tool To Implement Lean Manufacturing. It Is A System To Control The Flow By Systemizing The Place, Thus Supporting The Culture Of Continuous Improvement. 5S Is The Acronym For Five Japanese Words Seiri (Organization), Seiton (Neatness), Seiso (Cleanliness), Seiketsu (Standardization) And Shitsuke (Discipline) Respectively. 5S Has Been Introduced In

Japan Mainly In The Manufacturing And Service Industries. Toyota, the Major Car Manufacturer Is One of The Pioneering Firms Who Adopted The 5-S Principles (TPS et al.). The Japanese Believe That 5s Principles Are Not Only Valuable At Their Places, But Also Improve Their Cognitive Sense. The 5s As The Five Pillars To Establish And Maintain A Total Quality Environment In An Organization (Osada).

Every problem is an opportunity to improve the process and environment. In order to overcome this problem, 5s which are relatively simple and inexpensive technique. The method used in this paper is, divide each S in 5 steps having one point for each, according to the performance of each worker points has been given and analysis carried out weekly. Tagging process is used for sorting. The outcome is the execution of 5S and performance calculation of workers. The paper shows how to sustain 5S by maintaining continuity of workers (Patil, 2015).

Implementation of 5S methodology in the small scale industry, it shows significant improvements to safety, productivity, efficiency and housekeeping (Agrahar).

In the frames of own research it has been analysed and implemented the 5S rules in the production process, research clearly showed, that very essential is training of era about the 5S rules. The essential thing is to divide activities on some main steps and to maintain the continuous improvement (J. Michalska et al.).

5S methodology can effectively provide a better workplace for the administration staff of a higher learning institution as they feel more comfortable, safe and organized which in the end could assist them to improve the quality of their work (Y. Johana et al. 2014).

In 2010 a research was conducted on the topic of “Implementation of 5S practices in the manufacturing companies: A case study” (Rahman et al. 2010). Implementation of 5S in HRM that the employees of an organization fail to change while the customer demand and the market expectation changes rapidly (D. S. Uma and A. Kannan 2010)

The literature review shows that 5S tool can be implemented in various industries, whether it's micro, small, medium or large. It is found that 5S tool helps to improve safety, efficiency and effectiveness of place.

3. Success stories of 5S

Overall these 5S activities as a whole contributed in minimizing waste, optimizing performance, maximizing profit due to reduction in losses, improving safety and the last but not the least capability of workers (Rajkumar and Niyati et al. 2017).

5S initiatives have resulted in 93% reduction in transportation distance travelled by the work in manufacturing operations and improvement in overall space utilisation by 42% (Skinner et al, 2001).

The need of having 5S method implemented represent one of the first step taken in the Lean Management strategy and it determines, as a result, the increase of the productivity of the organization. Moreover, due to 5S, the factory is a cleaner place, the safety at workplace and the product quality is increased, the problems are easy to detect and prevent, waste and costs are reduced, the product or service fulfils the customer needs in the most efficient manner(*Cristina Veres (Harea) et al.*).

The process flow at the Hari Bio-Mass Processing Unit is not streamlined due to the wide variety in product specifications, the growing demand, the push production policy, and the nature of heavy metal and woodwork operations. As a result, the plant has turned into a jungle of dirty machines and excess materials, scrap, and rework spread all over plant floor creating a plenty of flow complications and causing space and production issues (K.Ramesh1, 2014).

The result of implementation of 5S is 12.91% sq. ft. space saving in the storage department, so that movement of men, material is reduced (Thakkar, 2014). Enhancements in various functional areas in a food and beverage industry were demonstrated using 5S techniques. The results showed that 5S methodology can be effectively used in this sector. Various advantages are found which include: Process development by cost reduction, Better usage of workplace, Prevention of losing tools, Process growth, Increasing efficiency, Shortening of time required for searching necessary things, Improvised working conditions for workers, Reduced machine maintenance cost and so on. Though this experiment shows numerous benefits of 5s in a food and beverage industry, it can be applied to any industry.

6S concept provides clean, well-organized, safety industrial working environment and reduces the floor space area. Our own research clearly showed that training of workers about 6S rules is very essential. Implementation of 6S is half the battle and the other half is sustaining it (Vinodkumar, Akash et al.)

4. 5S Methodology

5S is an acronym for the following Japanese terms:

SEIRI (Sorting and disposing unnecessary items): This first step refers to the removal of all unwanted materials near the workplace, sorting all the tools, materials and other equipment in the workplace. Important equipment is stored accordingly, which reduces the hazards at the work place.

SEITON (Set in order, Orderliness): Place for everything, and everything must be in its place. Tools, equipment, and materials must be systematically arranged for the easiest and the most quick access and movement. If everyone has quick access to an item or materials, work flow becomes efficient, and the worker becomes productive. Every single item must be allocated its own place for safekeeping, and each location must be labelled for easy identification

SEISO: (Shining, Cleaning, Removal of waste and dust) consists of cleaning up the workplace and giving it a 'shine', it is clean enough to make a good impression. Cleaning should become a daily activity. Every tools and equipment's should be clean at regular intervals and also restored at their own places after their use.

SEIKETSU (Consistent and Standardized work environment along with Cleanliness): Seiketsu encompasses a clean and regular working and living environment, both personal and environmental cleanliness. This is because dust, dirt and wastes are the source of untidiness, indiscipline, inefficiency, faulty production and work accidents

SHITSUKE (Sustain, realization of the above set of rules in order): Implementing this idea will demand self-discipline from the workers from the compact self-discipline connected with implementing and obeying the rules of regularity in cleaning and sorting. It leads to increasing the consciousness of staff, and decreasing the number of non-conforming products and processes, improvements in the internal communication with human relations.

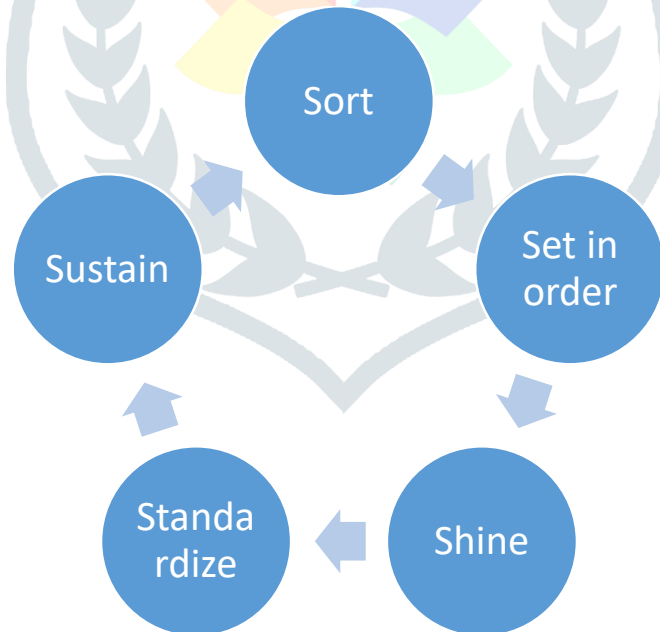


Fig of 5S elements

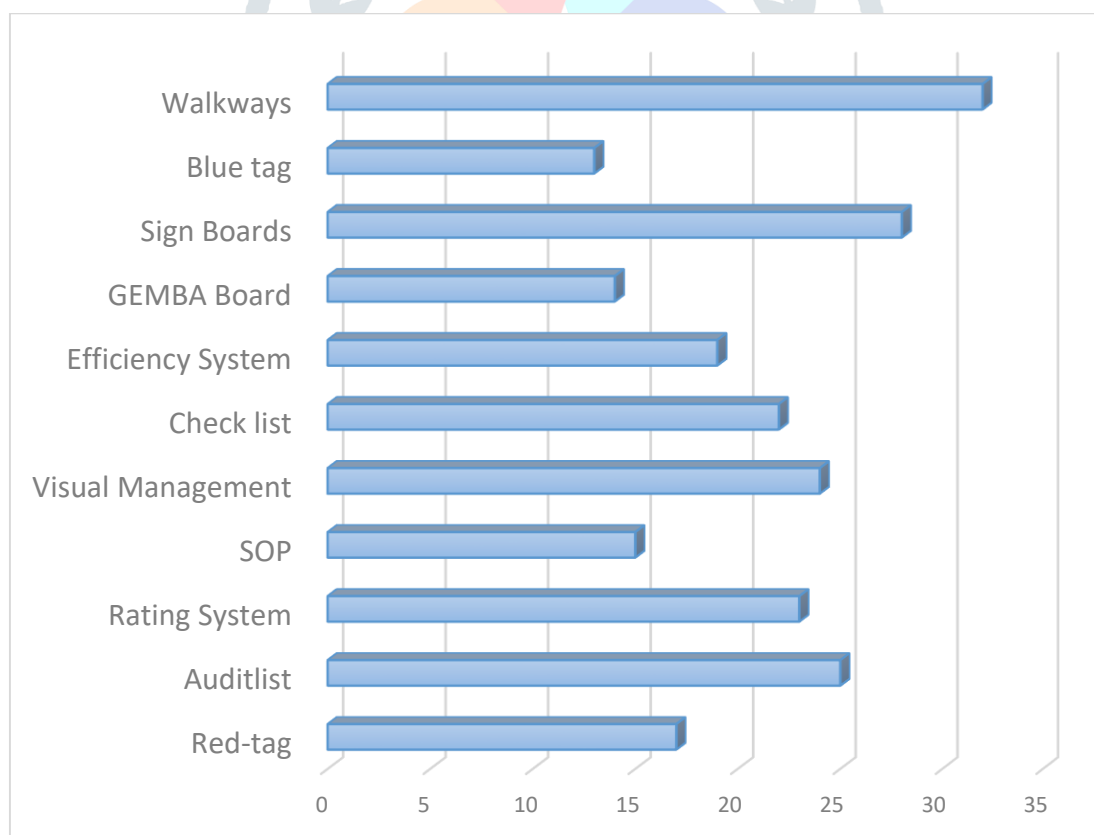
6S concept is not a new concept, but is derived from 5S concept having one more “S” as “Safety” with organization, with environment and with health. After implementing 6S concept, organization/industry achieve effective organizational improving performance such as, reduced wastage, reduced defects, increase productivity, less making accidents, improve workers/employees morale for work with organization etc.

5. List of different industries implemented of 5S Methodology

Here below a list of the companies who implemented a 5S methodology in various manufacturing and service industries.

Name of company (small scale)	Year of implementation 5S
Kahalgaon Super Thermal Power Station	2003
Anta Gas Power Project	2003
Faridabad gas power station	2006
NTPC Limited- SRHQ Hyderabad	2006
Rishi Bakers pvt. Ltd, Kanpur	2004
K N Food Industries private limited	2004
NTPC Limited, Kolkata Office	2005
Shivam Foods, Nagpur	2004
Parle Biscuits Private Limited, Bangalore	2007
RINL – VSP (Wire Rod Mill)	2006
Hindustan Zinc Limited- unit 1	2008
Rail Coach Factory, Punjab	2008
Rohm and Haas (India) private limited, Chennai	2008
GRP Limited, Ankleswar	2010
SAIL- Bhilai Steel Plant	2012

6. Different tools and techniques used in 5S methodology



5S methodology carried all the different techniques like red-tag, audit list, SOP, visual management, efficiency system, GEMBA board etc. for a better organization of the workplace, reducing unnecessary items, quality measurement, time reduction, better space utilization, enhance productivity etc.

Sort, resulted in removing unwanted items, broken tools, unused parts and scrap materials by using red-tag. Unused inventory was returned to purchasing, rarely used tools were located in storage and frequently needed items were located near machine in the reach of operator and scrap items were discarded (Devkar and Raut 2017).

Set in order, resulted in several changes in the organization of the workplace by using blue, red, green, yellow tags. Each of the workstations received their own set of tools. All the tools were colour coded to their respective workstation. Most of the time of worker is wasted in the tool and material sourcing and selecting. By this set in order process, we have eliminated almost 20-25 % time of the worker. We made the different arrangement for the placing for tool and raw materials (Uttam et al, 2017).

Shine step includes activities like cleaning workplace, maintaining its appearance and using preventive steps to keep workplace clean. Dirty working area containing dusts, scraps, oil etc. creates defects in product, equipment and process malfunctioning as well as safety hazards to employees. , A checklist can be made for particular areas which are to be swept, scrubbed and sanitized on a regular basis (Akash et al, 2014).

Standard work is one of the most important principles of Lean manufacturing. Developing standard operating procedures for the employees in the assembly area. Overall these activities as a whole contributed in minimizing waste, optimizing performance, maximizing profit due to reduction in losses, improving safety and the last but not the least capability of workers. Audit list, check list, SOP, efficiency system, sign board, GEMBA etc. will help organisations to standardise its procedure (Saad et al. 2015).

7. Obstacles in 5S implementation

The lack of leadership and TEI are only the common misunderstandings or errors carried out in the 5S management (Lixia and Bo, 2008). Grier (2008) argues that resistance to change is a significant challenge in implementing and sustaining a 5S system. Becker (2001) has identified that most significant barriers in the implementation 5S program are lack of improved communication lines and lack of employee involvement. Eocha (2000), Warwood and Knowles (2004), and (Ablanedo-Rosas, 2010) have identified the following obstacles in the path of successful running of 5S technique in the organisation.

- Low interest of top management in 5S program
- Lack of top management commitment
- Lack of clarity of the purpose of 5S implementation (Suárez-Barraza and Ramis-Pujol, 2012).
- Lack of enthusiastic and motivation of workers towards 5S
- Lack of impetus, vision and guiding principles of 5S
- Firm culture is also responsible for the failure of 5S program
- Hapless communications among employee in the organisation.
- Lack of application of plan, do, check, act (PDCA) in the implementation of 5S (Suárez-Barraza and Ramis-Pujol, 2012).
- Inability of management to convince employees that improvements from 5S initiatives are true or will be sustained (Radnor, 2010)
- Strained industrial relations with trade unions and employees severely affecting buy in of management to pursue improvement initiatives
- Lack of empowerment at workplace
- Inability of the management to convince all employees that 5S is there to stay and is not slogan of the week or month
- Low team spirit among the employees of organisation
- Low availability of resources or restricted resources
- Poor cooperation amongst departments (Ikuma and Nahmens, 2014)
- Demand of high financial investment is a reluctance to adopt 5S
- Poor employee attitudes
- Collision of position level of employee in the organisation
- Inadequate training for employees at all levels in the organisation
- Lack of kaizen implementation at the workplace

- Lack of acknowledgement and planning
- Lack of response to an inquiry
- Absence of appropriate record keeping mechanisms, and auditing mechanisms for Evaluating and sustaining the progress 5S program in the organisation
- Lack of incentives and rewards for work and process improvement
- Inappropriate evaluation and standardisation of 5S initiatives
- Intent of employees to do tasks with minimum of effort, even though it may cause damage to machinery or the product (Malik, 2014)
- Inability of the medium level management to oversee the laid out procedures are being strictly adhered at workplace by the employees
- Some of workers think that workplace become dirty again then why should it clean
- Some of workers think that their duties are to make the jobs not to clean and organise the workplace
- Some of workers think that they are already too busy in their work, they have no time to clean and organise the workplace (Titu et al., 2010).
- Some of employees have wrong perception that it is a tired process and failed several years ago
- Adoption of multiple implementation projects simultaneously by the organisations and lack of time for employees to the successful implementation of any one initiative.

8. Benefits of 5S implementation

5S technique is precious for every organisation since it facilitates realisation of motivating and safe working environment for all employees in the organisation. It requires top management commitment, promotional campaign, employee training, team working environment, evaluation of the results and maintaining the 5S records (Ho, 1997).

(Ho, 1995) Have reported that Wellex Corporation, USA has witnessed productivity improvement exceeding 26%, with turnover exceeding from US\$13.5 million to US\$23 million within two years of holistic 5S implementation.

(Ho, 1995) Have investigated the implementation of 5S principles in 3000 companies in UK and 200 companies in Japan. The results were good with response rate of 12%. They studied whether the 5S principles have significant contributions towards total quality management or not. The finding revealed that 5S practices facilitate realisation of total quality environment in the organisations which is important base of TQM in companies.

(Pheng, 2001) Has integrated the 5S principles with ISO9001:2000 in order to bring the movement toward total quality management. He observed that practice of 5S principles fulfil the most of ISO requirements and help in achieve the ISO9001:2000 standards more readily. He concluded that 5S principles directly contribute towards ISO requirements and in long run the integration of ISO 9001:2000 with 5S principle leads towards TQM.

Gajdzik (2009) has reported that 5S implementation by Arcelor Mittal, the biggest steel company in Poland, as a basis of TPM initiative, has resulted in increased work efficiency up to 150%, reduced breakdown by 90%, dropped down the number of accidents at work and reduced the production cost by 30%.

Hunglin (2011) has investigated implementation of 5S in Wan Cheng Industry in Taiwan, and observed that 5S attributes resulted in 38% reduction in average time consumed in looking for and retrieving of drills and also reduced 49% of time for mills. The benefits of time saving helped the employees for productions of goods and meeting of customer's demands.

Moradi et al. (2011) have studied in detail about the relation between 5S and TPM and evaluated the performance and effectiveness of 5S. He concluded that six big losses regarding time, waste, failure and rework are reduced significantly with 5S principle and found that 5S affects the TPM pillars directly and indirectly.

9. Concluding Remarks

The purpose of this study is to examine the implementation of 5S in various manufacturing industries worldwide and check the success of 5S implementation. This study clearly provides step-by-step 5S methodologies reported in literature by different authors in the successful implementation of 5S technique in the organisations. The paper highlights the success factors and obstacles of 5S implementation for the organisations in the support of knowledge who are interested to run the program. An insight into 5S implementation methodologies will be significantly helpful for researchers and practitioners to understand 5S program from its meaning to the end of its successful implementation and sustainability.

9.1 Gaps in the current literature on 5S

5S implementation in various manufacturing industries is significant, but among them, very few 5S implementations are reported in ceramic, paper, pressure vessels, cement, forging, paper and surface treatment industries and in service sectors.

After 5S implemented in manufacturing industries, it is advisable to measure the overall improvement brought to the respective organization through 5S implementation. However, it is observed that only few performance indicators were used which did not reflect the overall improvement scenario.

10. References

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