PRODUCTIVITY IMPROVEMENT BY USING 5S AND LEAN MANUFACTURING TOOLS: A REVIEW

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Abstract: 5s is a very popular method of lean manufacturing which helped so many industrial, educational, healthcare and other organizations to improve their productivity and performance along with reduction in processing costs, defects, errors and wastages. In this review article, recent study of 5s implementation over several types of organizations and effects of 5s implementation on performance and productivity have been discussed. 5s supposed to be an effective and worth working approach that might be used to maintain systematic arrangement at the work place as well as for improving the moral of employees.

Keywords: - Sort, Set in order, Shine, standardization and Sustain, Lean manufacturing, productivity improvement.

I. INTRODUCTION

1.1 Lean manufacturing

Lean manufacturing is considered to be a process or methodology which enables an organization to reduce the wastages, defects and errors in the production processes that results in improving the product quality and improves organization's efficiency and performance. The customers of any organization don't want to pay for the wastages that don't add the value to their buying. So it's a very important consideration to reduce the wastages to a significant extent for fulfilling the requirement of customers. Lean manufacturing tools help significantly to achieve these goals and commitments.

1.2 5s

It is a tool of lean manufacturing that contains sort, set-in-order, shine, standardize and sustain aspects. By applying these aspects of 5s lean manufacturing tool; organizations can achieve efficient production, performance improvement of processes and employees along with improved safety standards.

1.2.1 Sort

Sort is the first step of applying 5s in an organization. It is defined as the process of removing the unwanted things that do not add value to a product. The unwanted things might be tools, inventory, machines, furniture etc.

1.2.2 Set in Order

Set in order is the second step of implanting 5s. It is a process in which the randomness of the system or workplace is removed. Systematic arrangement of all the things necessary to add value to the product is carried out in this step.

1.2.3 Shine

Shine is the third step of 5s implementation. In this process, cleaning and shining of the work place, system and surrounding environment take place. It develops the positive energy and moral in the employees of the organization that results in their performance improvement.

1.2.4 Standardize

Standardize is the fourth step of implementing 5s. It mainly refers to the systematic planning and execution of processes, ideas and tasks. It helps in maintaining disciplined environment and work culture around the staff and management that further help in completion of pre-planned task with certain time limit.

1.2.5 Sustain

Sustain is the fifth step of implementing 5s in the organization. It refers to the following of rules and regulation that makes the implementation of 5s successful in the organization. The objective of sustain is to make 5s a long term program or work culture, not a short term program. For this objective, management and employees of the organization needs a collaborative approach.

2. Literature Survey

So many researchers studied and analysed the impact of 5s implementation in different organization. Some of their studies and findings are being discussed here-

Abhishek Jain et.al. (2014) studied the effects of implementing the 5s phenomenon in an Indian manufacturing industry and observed the improvements in overall improvement in productivity of the organization as well as in the improvement of work culture environment.

Ghodrati and Zulkifli (2013) investigated the comparative study in an organization before and after the implementation of 5s. It was resulted in the total productivity of the organization. It was observed that 5s helps in improving the productivity improvement regardless of the size and service type of the organization.

Mohd Nizam Ab Rahman et. al. (2010) analysed the effect of implementing 5s technology in two similar companies and it was observed from the results after implementing the 5s that the 5s helped in improving health of the workers, cleanliness of the workplace and safety from any accidents.

Jimenez et al. (2015) investigated the effects of implementing the 5s in some school and college laboratories and it was observed from the results that the safety and cleanliness of the working environment was increased and there was a significant availability of the workplace was observed after implementing the 5s technology. It was also resulted in cost and time savings in any work to accomplish.

Patel and Thakkar (2014) applied the 5s lean manufacturing technology in a ceramic manufacturing organization and it was observed to have better control of the process after the implementation of 5s. It was observed that the 5s helped in reducing the wastages and maintain the proper quality of production in the organization.

R. S. Agrahari (2015) studied the effect of implementing the 5s technology in a small scale organization. It was observed from the results that the 5s helped in enhancing safety, productivity, efficiency and housekeeping of the organization. It also helped in improving the employee's moral values and work ethics.

Shogo Kanamori et. al. (2015) implemented the 5s technology in a health care organization in Senegal. It was observed that the implementation of 5s helped in improving the work culture environment, orderliness, cleanliness, reduced unwanted items and systematic arrangement of the workplace. It was observed that the work environment got more efficient, patient centered and safe for peoples around it.

Oleghe Omogbai (2015) studied the effect of applying the sort aspect of 5s technology in an organization. It was observed that the sort aspect helped a lot in improving the systems performance to a great extent and other aspects of the 5s method can also be adopted for the improvement in overall performance of the organization.

Kshitij Mohan Sharma & Surabhi Lata (2017) applied the technology of 5s in a copper wire drawing micro scale organization in India. It was observed from the results that the overall work environment along with safety of the workers were increased. It was also helpful in housekeeping and reducing wastages in the organization.

Ribeiro et al. (2019) applied the phenomenon of 5s implementation in an automotive production line and it was observed from the results that the 5s helped in reducing the unwanted inventory, wastages and faults in the organization. It helped in arranging the organization more systematically and improving the overall production efficiency.

Shraddha P. Deshpande (2015) applied the 5s technology in an organization situated in Maharashtra India, well known for manufacturing of bags. The motives of the implementation of 5s in the organization were to achieve friendly and safe working environment along with improvement in moral and ethics of workers so as to achieve improved production efficiency. It was observed to have success implementation and achieving all above motives in the organization.

Gapp, Fisher, and Kobayashi (2008) studied the effects of 5s implementation in Japanese small scale industries with the help of computer aided software namely Leximancer. They were able to evaluate the theoretical data obtained from the organization and found out the usefulness of Leximancer software in understanding the organizational effects after implementing the 5s.

Rojasra and Qureshi (2013) studied the effect of implementing the 5s technology in a small scale industry situated in Gujarat namely Krishna Plastic Company. The 5s tool of the lean manufacturing helped the industry in improving its production efficiency from 67% to 88.8%. it also helped in reducing the wastages and processing time for the product to be accomplished.

Wazed and Ahmed (2009) applied the 5s lean manufacturing tool in a plastic moulding industry situated in Malaysia. After the implementation of 5s, it was observed from the results that the percentages of defected products were reduced to a great extent and the working environment for the workers was also enhanced. The cleanliness and safety aspects were also concluded to be enhanced.

Yogyakarta (2013) analysed the effects of implementing 5s lean manufacturing tool in Bengkel ABC. The results showed improvements in the cleanliness of the working environment along with systematic arrangements of work place. It was observed to have overall productivity enhancement of the organization.

Ablanedo-Rosas et al. (2010) studied the outcomes of applying 5s lean manufacturing tool in Mexican organizations. It was observed from the results that the low cost and high quality products were produced after implementing the 5s tool. Enhancement in cleanliness, work environment and safety were other benefits of the implantation.

Ravi Kiran and Prabhjot Kaur (2011) studied the performance of small scale organization after the implementation of 5s tool. 5s helped in refining work culture, enhancement in moral ethics of employees and improvement in overall production efficiency of the organization.

Purohit and Shantha (2015) discussed the proper and step by step stages of implementing 5s lean manufacturing tool in any organization. The implementation of 5s was done in a small scale organization namely Sphoorti Machine Tools Private Limited Bangalore. The results of the implementation showed reduction in unwanted inventory, defects and processing cost. The production efficiency of the organization was observed to be increased.

Moradi, Abdollahzadeh, and Vakili (2011) investigated the effect of applying 5s in a foodstuff production factory in Iran. The results of this implementation showed enhancement in productivity, safety and quality of the organization. It was concluded that 5s helped in reducing the losses and defects and improved overall production efficiency.

Lamprea, Carreno, and Sanchez (2015) investigated the target areas for implementing the 5s lean manufacturing tool in an organization situated in Colombia namely Caucho Metal Ltda. and then applied the 5s tool in the organization. The results concluded to have enhancement in overall productivity and quality of the products. Improvement in work culture and reduction in risks were also observed in this investigation.

Falkowski and Kitowski (2007) revealed the benefits of 5s implementation in any organization. The systematic approach for implementing 5s lean manufacturing tool was discussed with the advantages empirically. It was concluded that 5s helped in achieving greatly proficient, hygienic, and ergonomic work atmosphere.

Sari, Rahmillah, and Aji (2017) studied the effect of implementing 5s in a college laboratory situated in Indonesia namely Work System Design and Ergonomic Laboratory. It was concluded to have score efficiency enhancement by 50%. It helped in systemizing the work processes and reducing wastages along with reduction in processing time. The work environment and spirit of employees were also significantly enhanced.

Riad et al. (2015) investigated the effect of implementing the 5s tool in a food and beverages industry situated in Bangladesh. It was observed to have lots of irregularities before the implementation of 5s in the organization. The improvements in cleanliness, work culture, overall productivity, safety and reduction in wastages were observed after the implementation of 5s in the organization.

N. Khamis (2009) discussed the factors which affects the successful implementation of the 5s lean manufacturing tool and how the checklist should be prepared for successfully implementing the 5s. Top level management, workers, company's functions and background as well as proper training of man power play vital role in effective implementation of 5s lean manufacturing tool in an organization.

Gupta and Jain (2014) discussed the importance of implementing 5s in any organization whether it is micro, small, medium or large scale industry. 5s implementation was observed to increase the efficiency of the processes, process visibility enhancement, workers spirit enhancement and safety. The overall productivity and quality improvement of the organizations observed to be the significant advantages of 5s implementation.

Venkateswaran, Nahmens, and Ikuma (2013) studied the impact of hybrid and conventional 5s implementation in 3 different hospitals. It was observed from the results that both the implementation approaches helped in significant level of inventory management and space savings at the hospitals.

Gala and Wolniak (2013) discussed the effects of applying 5s lean manufacturing tool in a small scale industry. It was concluded that 5s helped in improving productivity and total quality of the organization. It reduced the risk level of employees working environment. It was concluded that all the people involved in the organization play the key role in successful implementation of the 5s.

Kakkar et al. (2015) analysed the effects of applying 5s in a manufacturing organization. It was observed from the results that the productivity and performance of the organization showed excellent improvements. The efficiency of the production reached 91% after applying the 5s lean manufacturing tool.

Veres et al. (2018) investigated the impact of implementing 5s in an automotive company situated in Mures County, Romania. The results concluded to have improved productivity, clean workplace, increased safety standards and product quality. It was observed to have reduction in wastages and manufacturing cost of the product. The customer demands were fulfilled with increase in production efficiency.

Pandya et al. (2015) studied the impact of 5s implementation in 18 health care centres situated in Gujarat. It was observed from the results that "sort" and "set-in-order" aspects contributed the most among all 5 aspects of 5s. 5s helped a lot in improving different health care facilities available at the centres. Proper arrangement and cleanliness of the clinical apparatus were achieved using 5s tool.

Ishijima, Eliakimu, and Mshana (2016) applied the 5s lean manufacturing technology in a hospital in Tanzania. It was observed from the results that the 5s helped in improving the overall performance of the hospital. It was distinguished to have better service quality to patients with reduced waiting time.

Veza, Gjeldum, and Celent (2011) studied the impact of applying the 5s lean manufacturing tool in bottling beverage company namely Croatian enterprises. After applying the 5s tool, it was observed from the results that a very large quantity of the wastages, defects and scraps were eliminated. It helped a lot in improving the overall production efficiency of the organization.

Kannan (2010) discussed the factors that affects the successful implementation of 5s lean manufacturing technology. Various aspects of 5s tool were applied to human recourse management section. It was distinguished that the management should provide a proper training for their workers for 5s implementation. The implementation of 5s in the organization should be pleasurable to the workers; it should not become a burden to them.

Ananthanarayanan (2006) investigated the effects of applying 5s lean manufacturing tool in NDE laboratories. It was strongly recommended to adopt 5s lean manufacturing tool in NDE laboratories since it brought organized structure of the laboratory, reduced wastages, improved the safety and health features in the laboratory as well as helped in proper data management.

Todorovic and Cupic (2017) evaluated the impact of applying 5s lean manufacturing tool in rubber manufacturing organization situated in Serbia. It was observed from the investigation that 5s helped a lot the organization in short and medium term period for improving the productivity performance. In the long term period, 5s implementation was not found to be very suitable due to some other parameters and factors that affect the productivity performance.

Filip and Marascu-Klein (2015) discussed the effects of applying 5s lean manufacturing tool for increasing organizational management performances. It was concluded from the results that the 5s helped in improving organizational management performance by reducing the errors, mistakes, defects, searching time and waiting time. It gave the proper in sight of process workflow as well as provided transparency and clearness to the processes.

Ayush khandelwal (2014) investigated the improvements after applying 5s lean manufacturing tool in a paper manufacturing industry. It was observed from the investigation that the time required for a process to complete and corresponding power requirement for the process were initially very high. After applying the 5s tool, it was observed that the time and power consumption, both reduced to a great extent that helped in improving productivity of the organization.

Chen and Meng (2008) studied the factors that resulted in unsuccessful implementation of the 5s in Chinese organization. It was concluded that the failure of any 5s implementation program mainly depends upon the employees of the organization. The proper training and moral enhancement of employees are the main factors that help in successful implementation of the 5s program. It is impossible to achieve success with 5s implementation without the dedicated involvement of employees.

Dinesh B. Shinde and Prashant N. Shende (2014) investigated the effects of applying 5s lean manufacturing tool for improving plant layout of any industrial organization. It was observed form the investigation that 5s tool helps in improvising the framework and structure of the organization. A proper systematic layout can be obtained using 5s tool. It formulates proper disciplines that ultimately help in improving overall productivity of the organization.

Shaikh et al. (2015) discussed the benefits achieved after implementing the 5s lean manufacturing tool in a small scale organization. It was observed from the evaluation that the 5s tool benefited in improving cleanliness in the work environment. It was observed to have less defects and errors, reduced down time of production and improved health standards after applying the 5s tool in the organization.

Yusof et al. (2014) investigated the effects of applying 5s lean manufacturing tool in a higher education organization working with 200 staff. It was observed from the results that great motivation in the moral of the staff was observed after the implementation of 5s. The discipline, work culture and systematic structure at the organization were significantly improved. 5s helped drastically in improving the services to the clients of the organization.

Kobayashi, Fisher, and Gapp (2008) studied the impact of applying 5s lean manufacturing tool in some organizations of UK, US and Japan. The results concluded that in Japan the 5s concept in taken to be applied in organization as well as in home, but in UK and US, it is considered to be applied only at the organization. It was stated that various organizational goals can be accomplished by proper implementation of 5s lean manufacturing tool.

Mohd Norhasni Mohd Asaad, Saad, and Yusoff (2015) examined a relationship between 5s, Kaizen and Organization Performance with the help of Rasch Model for some Malaysian automobile industries. It was observed from the results that implementation of 5s concept was much easier than the kaizen concept. It was concluded that top management strategies play a crucial role in proper and successful implementation of these lean manufacturing techniques.

Zhang Shangyou (2011) discussed some remedied to overcome the failure of the 5s lean manufacturing tool. The analyses were done in three different electronic assembly organizations situated in China. It was concluded that the employees and management will have to see insight of the 5s lean manufacturing concept. Only the proper arrangement and cleanliness at the work place are not defined as the 5s philosophy. The heartily dedication of employees and management is necessary for the success of 5s implementation.

Randhawa and Ahuja (2018) discussed an analytical hierarchy process for finding out the best attributes for implementing 5s successfully in the organizations. It was observed from the results that this method helped a lot many organizations to improve their productivity to a significant level. By using this method successful implementation of 5s was achieved and fruitfulness in the results was observed significantly.

Dizaji et al. (2011) established a relation between 5S principles and Human Factors affecting the productivity of organization. The case study was done in Tabriz-IDEM company situated in Iran. It was observed that 5s helped the organization to improve its structure, maintaining quality at production and improving safety of their workers.

J. Rahim, A.R Mohd Nizam, M.D Baba (2012) studied for establishing sustainability in the medium scale organization situated in Malaysia. It was observed from the investigation that 5s helped in achieving sustainability through proper management of time, power, money and manpower. Organizational goals were achieved using 5s implementation and the productivity was increased to a significant extent.

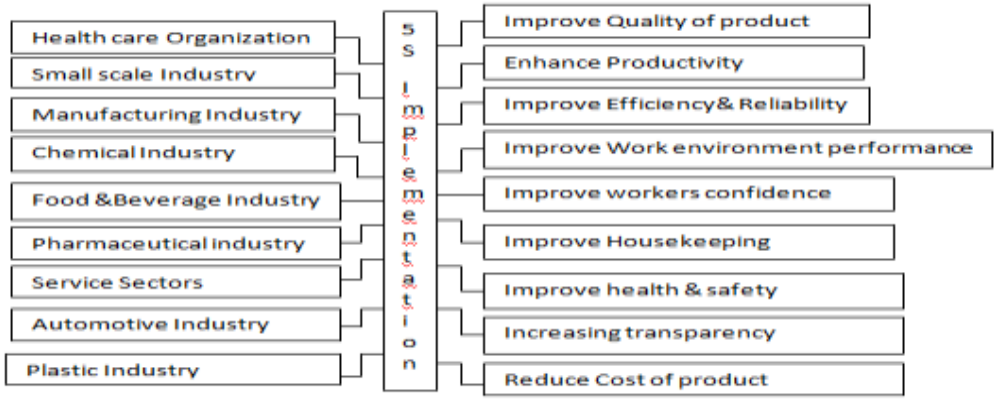
Daraei et al. (2015) identified and ranked different factors that affect the successful implementation of 5s lean manufacturing tool. It was observed that several management and work culture factors affect the proper implementation of 5s that should be minimized. By improvising these factors management will definitely able to apply 5s successfully and improve its production efficiency.

Singh Sidhu, Kumar, and Bajaj (2013) studied the impact of applying 5s lean manufacturing tool in agricultural industries. It was observed from the investigations that several organizational goals such as waste elimination, time reduction and cost savings can be achieved using 5s tool implementation that further helps in enhancing organizational productivity.

Dufay et al. (2017) studied the impact of incorporating 5s tool in a healthcare organization situated in France. It was observed from the results that the organization after implementing 5s achieved more success rate in satisfying their clients and work environment for the employees established more pleasant.

3. 5S Implementation: Review

Above listed researcher papers observe different areas shown in block diagram areas where 5s implemented and outcomes.



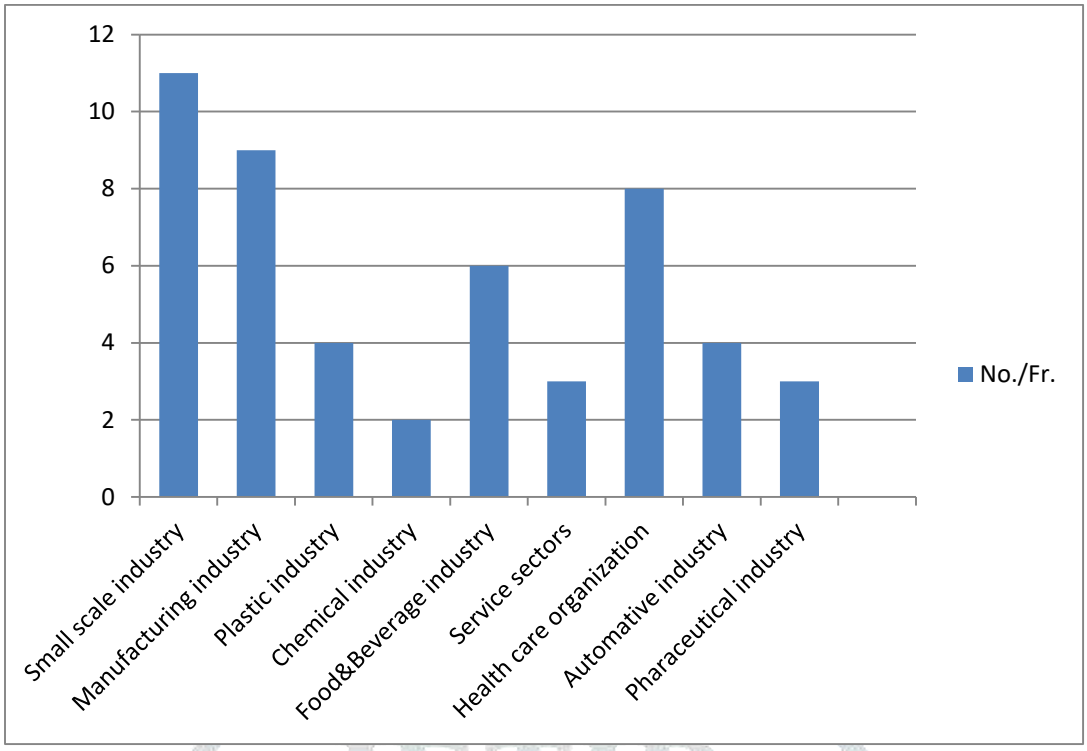


Figure 1

Fig.2 After 5S Implementation enhancing different parameters covered in paper shown in pie chart

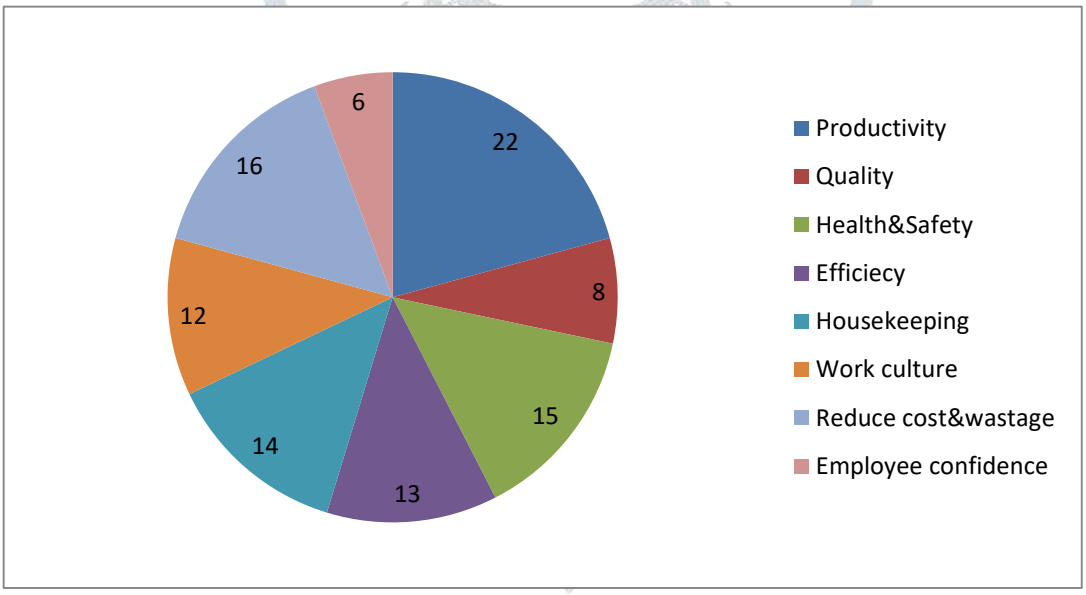


Figure 2

4. Conclusion

5s is supposed to be a very effective and worth working approach to accomplish efficient productivity and improved performance of the organization. 5s enables the organizations to improve their work environment, maintaining systematic work processes, reducing inventories and unwanted things around the work place, improving safety standards, reducing risks, defects and errors. It significantly helps in enhancing the moral ethics of the employees that result in improved productivity and long term efficient performance of the organization.

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