e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:06/June-2023 Impact Factor- 7.868 www.irjmets.com

REVIEW PAPER ON 5S, A LEAN MANUFACTURING TOOL TO REDUCE WEST IN SMALL SCALE INDUSTRIES

P.M. Rojasara[*1]

[*1]Lecturer, Mechanical Engineering Department, Government Polytechnic,
Rajkot, Gujarat, India.

DOI : https://www.doi.org/10.56726/IRJMETS42345

ABSTRACT

Small Scale Industries plays a vital role in Economy of India. It has emerged as powerful tool in providing larger employments after agriculture. It contributes more than 50% of industrial production in value addition terms and generate one third of the export revenue. Global markets are continuously changing and demanding products of high quality at low cost. Lean manufacturing, a management philosophy can help to produce a product of high quality at low cost by reducing all types of wastes at all levels of product manufacturing. 5S, a basic Lean manufacturing tool for cleaning, sorting, organizing and providing necessary ground work for workplace improvement. This paper deals with the literature review of 5S methodology for reduction of waste in manufacturing industries.

Keywords: Lean Manufacturing, 5S.

I. INTRODUCTION

To remain in business arena it is of upmost important to win hearts of customer though quality and cost of the product or service. It is also crucial to have sustainable production with continuous improvement. The present need of the organization is to deliver high quality product through continuous improvement at lower cost. [1].However, manufacturing organization throughout the world is under great pressure to reduce the cost and meet the challenge of maintaining global quality standards [2]. Lean Manufacturing is the hymn of survival and success of any organization through minimizing the wastage of resources. Moving towards implementation of lean manufacturing has become one of the key strategies to achieve cutting of cost. The goal of lean manufacturing is to minimize all types of non-value added activity (waste) through incorporating less human effort, less inventory, less time product development time and less space to become highly responsive to customer demand, while at the same time producing good quality products in the most efficient and economical manner.

The aim of this paper is to review 5S, a lean manufacturing technique in small scale industries. 5S is Lean manufacturing tool for cleaning, sorting, organizing and providing necessary ground work for work place improvement.

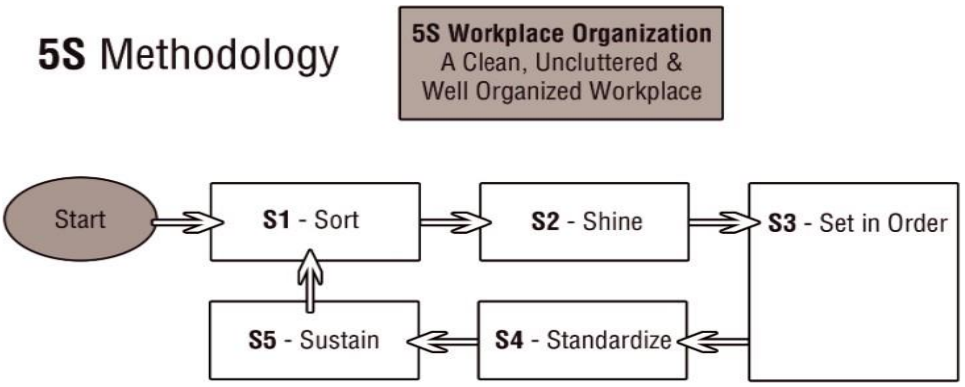

Fig.1 The 5S system

Poor workplace conditions may lead to rising of wastes such as time spent in searching for needed items or motion to avoid obstacles. It may also lead to raising an accident. Implementation can be started by establishing good workplace and housekeeping conditions. 5S is lean manufacturing tool for work place organization and it is fundamental to the implementation of lean strategies. 5S is a reference to five Japanese works which

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:06/June-2023 Impact Factor- 7.868 www.irjmets.com

described standardized clean up. The 5S are: (ReVelle 2002). In this paper I focused on 5S system, which make us able to understand the improvement criteria for particular S of 5S system.

S1 Seiri (Sort)

Seiri is the first S in 5S system, which is basically deal with the availability of materials and process of product manufacturing. The aim of Sieri is to organize the workplace and discards the items which are not needed on work place area.

S2 Seiton (Set in order)

Seiton is second S of 5S system which deals with the proper arrangement of equipment and tools on the shop floor. The main objectives of Seiton are forming a regular workplace, avoiding time loss while searching the material and mistake proofing work. The arrangements are done in such manner, that the necessary tools are arranged by the order of their use. It helps to reduce the travelling distance as the searching time of things gets reduced. Also, the labels, tapes, floor markings and signs are used to execute Seiton.

S3 Seiso (Shine / Clean)

In order to realize effective tasks, it is essential to create a clean and regular working and living environment. This is because dust, dirt and wastes are the source of untidiness, indiscipline, inefficiency, faulty production and work accidents. We can handle cleaning practices by two approaches: “general cleaning of workplace” and “machine, hardware and tool cleanliness”. Seiso process indicates the “Renovation of the work place”. The main purpose of SHINE is not to show beautifulness but to serve a purpose.

S4 Seiketsu (Standardize)

Seiketsu is generally means for make a peak standard which should be achieve by the manufacturing process practice. Standard should be communicative and easy to understand. To create the guidelines for Sort, set in order, and Shine is called Seiketsu. The main purpose of it is to create best practices and to use the best practices by the workers and members. By not having the clear standards, there is no path to keep eye on the improvements. The standards are easy to get and communicable.

S4 Shiraukw (Sustain)

Shitsuke (Sustain) is the last S of the 5S system which is deal with the regularity of maintaining the standard of the organization for the particular process, which is only done by regular practices and by following the proper instruction of machine operating. By doing regular following of accurate of instruction we can maintain the machine condition at its peak level, which may help for better production and stay away from breakdown.

(1) Removing small faults through the aid of cleaning.
(2) Providing the execution of visual control.
(3) Providing the performance of protective activities.
(4) Granting the responsibility of the machine to the operator.
(5) Formation of a disciplined company.

II. LITERATURE REVIEW

Mohd Nizam Ab Rahman et al. (2010) implemented lean manufacturing on two companies. Company A’s prime goal was to achieve customer satisfaction via quality products and excellent services by experienced employees. Company B’s goal was to become a number one ASEAN company for quality assurance, cost and delivery. In company B, both of the administration and manufacturing site showed the least value with compare to other parts. It can be eventually said that company A secured upper position in the excellence level in comparison to company B. Therefore, company B illustrated weaknesses in numerous aspects. This is because of the overall proportion of company B where it only acquired 72.35% as compared to company A that gained an excellent level of 90.48%. The variation in this percentage happens probably due to the size, company background as well as the positions of both companies in Malaysia.

Mohammad Rasouli Dizaji et al (2011) Studied for relation of 5S tool and ergonomics conducted at Tabriz-IDEM, Iran. For collecting the needed data they used the three various types of questionnaires. The questionnaires constructed based on 5S, ergonomics and TPM. To determine the sample volume data, author used Krejcie and Morgan’s tables. They used numerous types of tests for result purpose. T-test between 5S and ergonomics, Pearson correction tests between 5S and TPM and ergonomics and TPM. Eventually, 5S principle,

ergonomics and TPM is interconnected modes of technique, which are used to enhance plant efficiency as well as productivity of organization.

Arash Ghodrati etal. (2011) examine the performance characteristics of the 5s implementation the industrial organization. The selected industries for study are from various diverse fields of work and providing various services. This study has been performed in different companies with different kind of products and services. The study has followed descriptive research based on survey method. In this methodology they collected the data by distributing the questionnaire five industries which had implemented 5s before that. Individual analyses of five organizations successfully showed that 5S implementation has an effective impact on performance of organization. The results are obtained by comparing different parameter of the 5s in different industry. They used SPSS and excel software to ease of the process. The results clarify that the 5S is an effective tool for improvement of organizational performance. It does not dependent In order to continue improvement for achieving higher performance of plant the 5s methodology support every time in any situations. In the last we can say that by the using of 5s, efficiency of organization is increased and 5s has huge positive impact of the overall organization interims of productivity and performance.

A study done in a Malaysian Automotive Parts Manufacturing by Nadirah Roslin et al (2012) describes the progress in its early stages of lean manufacturing implementation. The observation of lean manufacturing success determinants is limited to this case, and care should be taken while generalizing the results of this case study to other Malaysian manufacturing organizations. The literature suggests that there are few critical success factors such as availabilities of resources, organizational culture, and information technology proficiency which impress each dimension of lean manufacturing.

Kaushik Kumar et al (2012) described the steps to be followed for the implementation of the 5S in any industry. Authors clearly mentioned that, if any industry implements this lean tool, then it will be very beneficial for the organization. They mentioned that what is 5S and how and when it is used. Research gives the brief idea about the Sort, Set In order, Shine, Standardize and Sustain. They also stated the various benefits of the system according to industry so it can be known exactly how and when to apply this methodology.

A study was conducted at Sunmill industry Pvt. Ltd. MIDC by R.A.Pasale et. al. (2013) to improve the organization standard in terms of manufacturing. The major problem was the time taken to setup the machine was more than actual machining cycle time. This occurred due to misplaced tools, fixtures and improper material. To decrease the finding time of the tool, author introduced the sorting concept of 5S. In this, they differentiate various tools according to the machining sequence processes. They introduced numerous “bins” to solve the lost material issues. They set the order of material of operation and jig fixtures according to the operation held. After the implementation, they observed the time taken for setting up the fixtures was shockingly differed from the initial one. The average time taken to set up the fixtures was 98 minutes before implementation. However, after implementation the time was drastically declined to 76 minutes.

P. M. Rojasra et al (2013) described the development of key areas, which could be used to adopt and implement the lean manufacturing practice and also presented some of the techniques to evaluate and reduce the resources needed on projects resulting in enhanced production efficiency [8]. The prime aim of this study was to implement 5S methodology and measure the performance improvement in Krishna Plastic Company, which is a small-scale industry situated at Amreli, Gujarat. It shows that a small manufacture can rapidly increase output and reduce quality threats by 80%. Also, it presents methodology for determining the real problem connected with industries in implementation of lean. Author also presented selection of required lean tools in the light of company’s long-term vision.

Mr. Khan Zaidahmed Zaferullah, Dr. Sanjay Kumar (2013) focuses on the application of JIT in Nigeria. The survey conducted by him had revealed that JIT is just as workable in Nigeria. The current scenario of globalization, Just in Time manufacturing system is coming as boosting for attaining manufacturing excellence in the industries. The various merits receiving from the implementation of JIT practices are Quality Benefits, Time-based Benefits, Employee Flexibility and Production process simplification. Implementation of JIT practices in a firm leads to contribution towards the economic growth of the country.

Dilek Acar Gürel (2013) did the conceptual evaluation of 5S model in the hotel. The conventional approach in hotel management is focused on performance results like more profit, productivity and satisfaction. They

described that an effective management system should be in hotels, in order to fulfill the expectations of the customers. According to Kandampully (2006), the main aim of the hotel management is to manage the service quality in the hotels. The main merits of 5S for hotels are the clean, organized and safe work environments, where failures and losses are reduced. Therefore, the adoption of this business methodology focuses on value and quality in the entire organization. In this study, 5S model is utilized as one of the processes which satisfy the quality and some management requirements of the hotels instead of the conventional practices. However, it is observed that the implementation of 5S in hotels is limited while the various fields' implementations are encountered. This study described 5S as an effective business model for the hotels and its prime purpose is to play a role to fill the conceptual gap. The hotels already have experienced on the quality of organization, sequence, neat and clean environment, and discipline too. The study is anticipated to enhance an awareness of the quality components in a business model for hotels, looking for more profit.

Vivekananda S. Gogi et al (2014) identify and improve the plant layout of pulley's factory to eliminate obstructions in material flow and thus obtain maximum productivity. The research exhibits that the efficiency of a plant layout can be increased by redesigning the plant layout using string diagram and proper planning of layout. These fundamental guidelines should be considered and followed. The issue was improper material flow on the shop floor and hence, the transportation time increased. The paper also explains about the material flow and layout design using the string diagram [20]. To examine the material flow, they used Outline Process Chart and Flow Process Chart. By following DGCA specified path, the efficiency was improved by 17.21%.

AR.Abdul et al. (2014) implemented 5S at the "Seremban Specialist Hospital", Malaysia. They used lean tool and 5S strategy for workplace organization and improve the efficiency of the hospital. The survey was conducted on several categories such as cleanliness, efficiency of work process etc. to get the results. After implementation of that, they successfully generated the level of understanding amount in the staff. Result also shows the immediate change is accepted after applying 5S. For analysis in various filed they used the various pie charts as well as bar graphs. Before implementing all the results obtained were poor to good, but after applying 5S result were drastically changed from good to batter and then best.

There was a sixth S added in the existing methodology. "SAFETY" was the next S after sort, set in order, standardizes, shine and sustain. Mayank Vivekananda S Gautam, et al. (2014) provided various methods for cleaning and working environment. Also, they mentioned the various safety equipment which are necessary during working on shop floor. Other than that, they also provided useful visual evidences to obtain more firm results.

Amardeep Singh (2015) gives the Review of 5S gives a brief idea about the 5S implementations accepted by various manufacturing industry also reflects that the 5S initiatives approaches to improving performance of the industry. Study shows that the 5S is not a short-term program, which is completed over the night. It is the long process. Also, this is a tactic which is used to improve the productivity in any field as the study suggests. The main aim of the 5S is to make the workplace orderly to improve safety and efficiency, to reduce the product defect rate and other possible wastes.

Ajay Anantrao Joshi (2015) emphasized about the 7^{th} s as in the methodology in the paper. The 7^{th} s exhibits "spirit" (team spirit). The spirit stands for the formation of the team which has motivational leader and cooperative members. Targeted outcomes after the implementation of spirit are better communication among the employees of the organizations. Workers feel the self-motivated at every time and they work with full of energy and with extreme high confidence. Spirit reduced the boredom approach of the employees toward their jobs. After all, the employees got better understanding of the problems and solve the issues with some appropriate approaches; hence, the healthy environment can be created. "Sphoorti Machine Tools" has improved productivity by successful implementation of 5S methodology. This study's main aim is to improve the bottom-line production without the need for capital investment which was conducted by Soumya R. Purohit et al (2015). Also, they have found increase in productivity and hence profit levels too. The other merit behind this methodology implementation was higher enthusiasm and punctuality among the workers and safer working situations. Also, the 5S concept is evolving into a 7S Methodology as there are two new aspects to add as 'Safety' and 'Security'. Therefore, they described that this methodology is still evolving and a lot of innovations to implement this methodology are also coming up in future.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:06/June-2023 Impact Factor- 7.868 www.irjmets.com

Mayank Dev Singh et al (2015) conducted a study at "Sandvik Asia Pvt. Ltd., Mehsana, Gujarat with objectives of reducing the abnormality. Also they faced the problem of improper materials handling and waste of time and motion. There is no visual glass by which one can see the fluid which can flow in the pipe. To solve the issues, they used 5S methodology, and they used manual sorting of material and provided the stopper at fallen down area. They allocated the tray in which the clothes and materials can be put. Additionally, a specific place was introduced for air gun. After Implementing lean manufacturing and 5S the searching time is reducing to 5-6 minute from 14- 16 minutes. They saved 640+ pages per year by providing updated preventive maintenance system.

The study carried out in one of the leading company in M.I.D.C (Ambernath Maharashtra) by Saad Shaikh et al (2015) showed that implementation of an effective tool named 5S helps to manage materials which can improve housekeeping, environmental conditions, health and safety standards and increase productivity and quality. Also sorting eliminates unused, unwanted material from the storage room. It is observed that, how setting the things in order allocates space for components, and due to this , it gives more space for storing more material and tools and results in reduction in searching time. As 5S reduces the searching time, it improves the production and quality of the products and disciplined environment is developed amongst employees and organization. It was observed that by applying the methodology, the effectiveness enormously surged from 55% to 75%.

Priyanka Rai (2016) highlighted that 5S is required to be followed in HRM for the organization to reach the pinnacle of glory and at the same time care should be taken. The research showed that after implementation of 5S practice, its benefits for industrial organizations are more. The reliability has been carried out for the data analysis. The data was coded in terms of Likert scaled questioner form. Total 450 employees took part from diverse field of operations in this. The results showed that the technique is very useful, applicable and beneficial. But it also shows that some organizations are implementing 5S in some proportion, not as whole policy because of the employees .They show less interest towards their role in 5S implementation. But overall it can be said that 5S is a required quality management tool which causes to improve performance of employees in any organization without any limitation on different kinds of products or services and organizations need to consider it as a part of their organization strategy.

Abhay R. kobarne, et al. (2016) describes the most considerable issue in the company and which was the poor training as well as lack of awareness methodology like 5S. They observed that lack of communication, the wide gap between the upper level management and the ground employees and less knowledge of some methodologies were the primary issues in the industry. Therefore some critical decisions of 5S activities, containing time and budget were approved by management. Thus, more cooperation from all level of people is suggested during implementation period. It was seen that the checklists which were made earlier, were not as satisfied as they should be. However, after implementation, the results started to come satisfactory. Also, it was also observed that continuous training is the prime element to change the organization's environment. Moreover regular assessment should focus on improvement and development about all inputs in the industry. Along with these aspects an additional aspect which is safety was also increased. Eventually, the 5S improved overall performance and reduced the wastes in manufacturing and also promoted neatness in storage and reduced the inventory.

Deepak Dhounchak et. Al. (2017) conducted implementation study on the industry of the manufacturing. The main problem in the industry was lack of management and improper working place. Author examined there were lots of problems in the industry like improper manner of production, lack of safety towards worker, dirty workplace, and disarrangement of tools. In order to resolve these problems they introduced the concept of 6S in the organization. They made red tags to identify the unwanted items to maintain proper tools arrangement. They made specific tools space to put the all the tools as per their designations. To improve the cleanliness on the shop floor they provided several techniques of cleaning. Also, they introduced the worksheets to keep the standardizations of the organization appropriate. They allocated the safety kits to the workers and gave the knowledge about that kit by arranging safety awareness programs. After implementing 6th S the organization became very well arranged and enhanced safety of workers.

Sagar et al. (2017) analyzed and implemented the 5S methodology in Harsh Polymers. The main problem faced

by them was the utilization of raw materials and time wasting for finding the tools. Also the place management was improper and the labors were unaware of modern innovative techniques. The research suggested that the most essential thing is to implement the rules. In order to solve the issues, they provided the bins for raw materials and tools. They created the racks in which they managed the tools according to the series of operation. Consequently, 25% to 30% of time was saved of worker by implementing this. Also the audit sheet was provided to maintain the above 3S and that is the main aim of 4th S. By the cooperation among the staff and workers, all the aspects of 5S were achieved.

Oleghe Omogbaia et al (2017) used Dynamic approach to implement the lean tool 5S methodology. They observed problems like out of order manufacturing, demand fluctuations, plant is small and tidy, and product manufactured is seasonal product. The SD model was built on various variables such as order entry rate, lead time, short time, manufacturing cycling time etc. This dynamic model is able to access the advance improvement in lean manufacturing. The analysis result shows that total time spent on searching the items is reduced from 0.6 to 0.2 work hours per day which exhibits 67% improvement. The company's managers need to adopt the methodology to improve the aspects of lean using an SD modeling technique.

Shreya Chavan et al. (2017) studied the implementation of 5S in Prabha Engineering manufacturing industry in Rabale, Mumbai, Maharashtra. 5S system implemented in the manufacturing unit which is found to be appropriate due to the many merits such as the wastes, scraps and losses were minimized, and production were controlled with flexible workstations. The main problems were ineffective inventory management, lack of quality improvements, quality control and lack of employee participation. After sorting the raw materials, labeling the tools and areas, removing dust and oils from the floor, creating the guidelines for above three and by keeping the discipline the desired results were gained.

III. CONCLUSION

The literature survey proves that the 5S, a Lean manufacturing tool is one of the most appropriate as well as beneficial one for any industry who wants the improvements in their existing system. Lean manufacturing is one of the options to reduce non value-added activity (wastes) and improve operational efficiency of the organization. The efficient implementation of 5S technique leads to subsequent improvement in productivity of the manufacturing plant. The 5S improves environmental performance and thus relate primarily in reduction of wastes in manufacturing. It promotes neatness in storage of raw material and finished products. The 5S implementation leads to the improvement of the case company organization in many ways for instance.(1) Better usage of working area, (2) Work environment improvement (3) Prevention of tools losing. (4) Reduction in accidents. (5) Reduction in accidents. (6) Reduction in pollution. (7) Discipline in the employee. (8) Increasing of awareness and moral of employee. (9) Improvement in the internal communication. (10) Improvement in the internal human relation. (11) Decreasing of mistakes through error proofing.

IV. REFERENCES

[1] Mohd Nizam Ab Rahman, Nor Kamaliana Khamis, Rosmaizura Mohd Zain, Baba Md Deros and Wan Hasrulnizzam Wan Mahmood (2010): "Implementation of 5S Practices in the Manufacturing Companies: A Case Study" American Journal of Applied Sciences 7 (8): 1182- 1189, 2010 ISSN 1546-9239 pp.1182-1189.

[2] Mohammad Rasouli Dizaji, Reza Rostamzadeh , Saudah Sofian and Kamal Rahmani (2011) : "Relation of 5S principles and Human Factors Engineering (Ergonomics) in Possibility of TPM Implementation (case study)" IPEDR, vol.10 ,IACSIT Press, Singapore pp. 63-73.

[3] Arash Ghodrati, NorzimaZulkifli, (2013): "The Impact of 5S Implementation on Industrial Organizations' Performance ", International Journal of Business and Management Invention, vol.2 (3), 2013, pp.43-49.

[4] Eida Nadirah Roslin, Shamsuddin Ahmed, Siti Zawiah Md. Dawal and Norjamalullail Tamri (2012): "Strategies for the Successful Lean Manufacturing Implementation" IJERT Vol. 1 Issue 9, ISSN: 2278-0181pp.01-06.

[5] Kaushik Kumar, Sanjeev Kumar (2012): "Steps for Implementation Of 5S" IJMRA Volume 2, Issue 6 ISSN: 2249-0558 pp.402-416

[6] R. A. Pasale, Prof. J. S. Bagi (2013): "5S Strategy for Productivity Improvement: A Case Study" Paripex - Indian Journal of Research, Volume: 2, Issue: 3, ISSN - 2250-1991, pp.151-153.

[7] P. M. Rojasra1, M. N. Qureshi (2013): "Performance Improvement through 5S in Small Scale Industry" IJMER Vol. 3, Issue. 3, ISSN: 2249-6645, pp.1654-1660.

[8] Mr. Khan Zaidahmed Zaferullah, Dr. Sanjay Kumar (2013): "Manufacturing Excellence through JIT Approach" IJAIEM Volume 2, Issue 12 ISSN 2319 – 4847, pp.302-305.

[9] Dilek Acar (2013):" A conceptual evaluation of 5S model in hotels" African Journal of Business Management ISSN 1993-8233 Vol. 7(30), pp. 3035-3042.

[10] Vivekanand Gogi, Rohith D, Shashi Kiran K, Suhail M Shaikh (2014): "Efficiency Improvement of a Plant Layout" IJIRSET Vol. 3, Issue 4 ISSN: 2319-8753 pp.11203-1109.

[11] AR.Abdul Aziz, 2MB. Nishazini, Fareza, N.A.Azizan (2014): "Survey to See the Impact Of 5S Implementation among Staff of Kpj Seremban Specialist Hospital, Malaysia" IOSR-JBM Volume 16, Issue 3, e-ISSN: 2278-487X, p-ISSN: 2319-7668 pp.82-89.

[12] Vinodkumar S Gautam, Akash R Shah, Ankitkumar N Parmar, Asso. Prof. Vijay D kedariya (2014): "Study of the 6s Concept and its effect on industry" IJETAE Volume 4, Issue 10 ISSN 2250-2459 pp.272-277

[13] Arashdeep Singh, Inderpreet Singh Ahuja (2015): "Review of 5S methodology and its contributions" Int. J. Process Management and Benchmarking, Vol. 5, No. 4

[14] Ajay Anantrao Joshi (2015): "A Review on Seven S (7S) as a tool of Workplace Organization" IJIET Volume 6, Issue 2, ISSN: 2319 – 1058 pp.19-26.

[15] Soumya R. Purohit, V. Shantha (2015): "Implementation of 5S Methodology in a Manufacturing Industry" IJSER Volume 6, Issue 8, ISSN 2229-5518 pp.225-231.

[16] Mayank Dev Singh, Swati Singh, Abhishek Chokshi, Harshad Chavan, Dhrudipsinh Dabhi (2015): "Process Flow Improvement through 5S, Kaizen and Visualization" IJIRSET, Vol. 4, Issue 3, ISSN (Online): 2319 – 8753, pp. 1103-1112.

[17] Prof. Saad Shaikh, Ansari Noor Alam and Khan Naseem Ahmed, Sawant Ishtiyak Sayyed Ziaul Hasan (2015): "Implementation of 5S Practices in a Small-Scale Organization" Volume-5, Issue-2, ISSN (ONLINE): 2250-0758, ISSN (PRINT): 2394-6962, pp.130-135.

[18] Priyanka Rai (2016): "Effectiveness of 5S implementation on organizations performance" Abhinav Publication Volume 5, Issue 1, Online ISSN-2320-0073, pp.01-10.

[19] Abhay R. Kobarne, Vineet K. Gaikwad , Sourabh S. Dhaygude, Nikhil A. Bhalerao (2016) : "Implementation Of '5s' Technique In A Manufacturing Organization: A Case Study " SRJIS, VOL-3/23, ISSN – 2278-8808, pp.1851-1872.

[20] Deepak Dhounchak, Sandeep Kumar (2017): "Application of 6S Approach in Manufacturing Industry - A Case Study" IJSRCSEIT, Volume 2, Issue 5, ISSN: 2456-3307, pp. 432-435.

[21] Sagar D Ghagare, Abhay A Desai, Rohit B Patil, Uttam Y Siddh (2017) "5S implementation in small scale industry" VOLUME-4, ISSUE-8, ISSN (PRINT): 2393-8374, (ONLINE): 2394- 0697 ,pp.23-29.

[22] Oleghe Omogbaia, Konstantinos Salonitis (2017): "The implementation of 5S lean tool using system dynamics approach" Procedia CIRP 60 (2017), pp.380 – 385.

[23] Shreya Chavan, Reena Pant (2017): "Process improvement by using '5S' in manufacturing unit: A case study"

[24] Vaibhav Bharmbhe, Subh Patel, Pratik Mordiya, Vishal Acharya (2020) "Implementation of 5S in Industry: A review" MIRJGTU, Volume-2, Issue-1, ISSN: 2521-8880 (2020), pp.12-24.