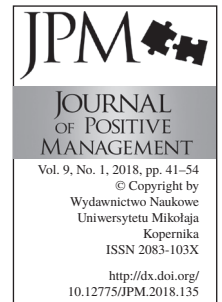


A PRACTICAL APPLIANCE OF THE 5S METHOD IN THE WORK ORGANIZATION OF THE MANUFACTURING COMPANY

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Abstract

Purpose: The aim of this paper is to present the theoretical aspects of the 5S method, its constituent elements, as well as the possibilities of its practical use in a production enterprise. In addition presenting problems and limitations in the implementation of the 5S method in the company.

Methodology: The used research approach was the analysis of Lean Management literature and case study based on information from lean managers and implementation documents of the manufacturing company.

Originality/value: The paper can provide value for people involved in Lean Management, emphasizing the theoretical aspects of the 5S method and its practical appliance. This paper can provide value for leaders who want to improve work organization and are not involved in Lean Management or for managers of smaller companies operating in the cable industry.

Keywords: Lean Management, 5S, work organization

Paper type: Case study

1. Introduction

The constant growth of competitiveness on the global market requires companies to improve production and its organization. This improvement is a necessary factor to meet the expectations of customers who want to receive products cheaper and faster (Womack and Jones, 2003). One of the answers is the Lean Manufacturing philosophy, which is considered by many business practitioners and outstanding scientists to be the most effective method available. The tools and techniques used in the company allow for improvement of specific areas and elimination of wastage, which is not a value for the customer, and often generates high costs (Al-Aomar, 2011).

The 5S method is a fundamental Lean Manufacturing tool whose aim is to support the management process at workplaces, and more specifically to create a well-organized, effective, orderly and safe workplace (Womack et al., 2008). It is also the basis and the first step to implement other Lean tools such as Just-in-time, Kanban. The implementation of 5S involves all areas of the company from top management to employees at the lowest levels, building a culture of continuous improvement of the organization (Martínez-Jurado and Moyano-Fuentes, 2014).

The aim of the article is to present the theoretical aspects of the 5S method, its constituent elements, as well as the possibilities of its practical use in a production enterprise. In addition presenting problems and limitations in the implementation of the method in the enterprise.

The applied research tool was the case study method, which was developed at Harvard Business School as a practical teaching method, which is empirical in nature, because it amounts to analyzing and discussing real cases. This method allows to prepare an in-depth analysis of the problem, presenting its specificity and impact on other elements of the organization (Rebeiz, 2011).

2. 5S-main aspects and principles

The 5S method can be divided into two stages. The first of them consists of one-off activities, used to implement techniques – sort, set in order, shine. Only the effective transition of the first stage allows for starting the second – standardize and sustain. These are actions to maintain and improve previously implemented activities. Only the second stage forces employees to take permanent actions and change their habits. Therefore, it is extremely important for the management to build an appropriate awareness of employees and responsibility. According to 5S practices, employees should adapt their home practices on the ground of production activities (Jacaa et al., 2014).

Like the whole Lean philosophy, the 5S method is derived from Japan, so the name 5S is the acronym of the five Japanese words that are presented in Figure 1. The 5S tool is the five successive phases of work organization.

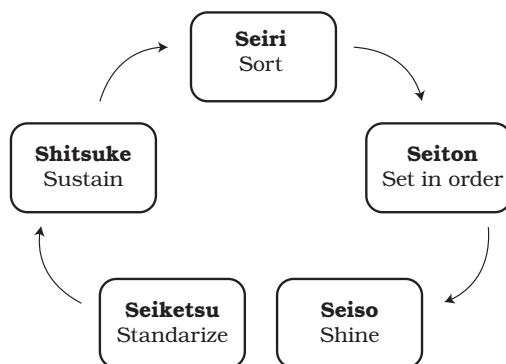


Figure 1. The 5S method scheme

Source: own study based on: Tapping, D. (2007), *The New Lean Pocket Guide*, MCS Media.

Sort consists in the division of what the employee needs at work, what he rarely uses, and what is simply unnecessary. The selection results in getting rid of the fugitives, materials, documents, tools, data, information that are kept in the workstation “just in case”, disrupting the production process and contributing to wastage. It is a revolutionary step, because you must get rid of old habits and build a new, slim thinking. The purpose of Sort is (Fabrizio and Tapping, 2006):

- 1) reduction of inventories,
- 2) more effective use of the workspace,
- 3) workstation free from unnecessary objects, tools, materials,
- 4) preventing loss of items.

Sort of items on the station are made according to the division: unnecessary things, currently unnecessary and needed. In case of a problem with the identification of an item on the station, you can use a helpful tool, which is a red card. A red card is a label that you write for a specific item if it turns out to be unnecessary or impossible to identify its owner. The note is posted to inform all employees. If, after a certain period of time, the object does not find the owner, it is removed or stored (Tapping, 2007).

Set in order is the arrangement of previously sorted items (Filip and Marascu-Klein, 2015). In line with this principle, each item must have its own specific location. At this stage, you must specify the location for each tool in the workplace. According to the adopted rule, finding the necessary item should not take more than 30 seconds. Then you can define the workplace as well organized. It should be remembered that this organization is prepared according to individual preferences of the individual, because each employee has different needs, demands and habits. Work area systematics effectively shortens the access time to tools and increases work comfort in the workplace (Fabrizio and Tapping, 2006).

Shine is the stage in which the workplace is organized. It consists of: removing residual materials, cleaning, vacuuming. These activities are also related to refreshing the workplace, such as painting the walls to improve the aesthetics of the workplace, which contributes to a better well-being of the employee. It is very important to constantly maintain the workstation in this order, which is why it is recommended to periodically clean the workplace and check the cleanliness. It teaches systematic employees and shows how removing minor damages affects their psychological comfort (Shaikh et al., 2017).

Standardize is the stage of developing procedures and standards that will ensure that the levels already achieved are maintained. It consists of: defining the scope of duties in 5S, then creating instructions on how to perform the first three steps of 5S, up to defining the standards for deploying tools in the station. As previously mentioned, regularity is necessary to maintain order in the workplace. It is therefore indispensable to shape new behaviors, rejecting old habits. This is to create a natural need to maintain order and cleanliness in the workplace. Visual

inspection is applied here, as well as supporting the maintenance of accepted rules, control cards (Filip and Marascu-Klein, 2015).

Sustain is the last stage of the 5S method. Like any tool in the Lean Management philosophy and it finishes with improvement. The stage of Sustain is the pursuit of excellence, building a conscious attitude of employees towards the purposefulness of the applied method, through active involvement in innovation and development. It is the duty of every employee to maintain a safe and friendly working environment. It is an extremely difficult process, as it forces a fundamental change in the thinking and habits of employees (Jadhav et al., 2008).

The 5S method should be perceived as a system that seeks to improve the quality of management and to build better working conditions. Its aim is to facilitate in-house communication, development of communicativeness and efficiency of information flow. The most important point of 5S is the involvement of all employees of the company, starting from the highest management staff, which should become the driving force of the entire implementation process. 5S is not only a method of rigid organization of the company, it is primarily building employee awareness and fighting with habits, which are often the biggest problem in building a well-organized work environment.

3. Practical use of 5S method

The first attempts to implement Lean in Poland were in the 90s of the twentieth century, when the managers of the automotive industry made attempts to improve production by implementing Lean tools. The most effective implementations took place in American factories located in Poland. However, these were only single implementations of kaizen or 5S. The following years include the development of Lean in Poland and the implementation of Value Stream Mapping, followed by attempts to implement the Lean culture, standardized work based on the involvement of employees. Lean was also implemented in electronic companies, and in recent years the most implementations are in the furniture and food industry. Polish companies implementing Lean are usually large enterprises, often with the participation of foreign investors. Of course, smaller companies also implement Lean, but with different efficiencies (Horbal et al., 2011).

The implementation in large companies is most often given to external consultants who train employees, analyze and then implement the Lean system together with them. The biggest barrier in the implementation of Lean is the specificity and dissimilarity of Polish culture from Japanese. Polish Lean should be analyzed separately for each company, because in each of them operates on a different level. Everything depends on the preparation for implementation, the attitude of employees, the commitment of management and the building of Lean culture. In Poland there are companies in which Lean operates almost exemplary,

but there are also those in which after a year of implementation it is neglected, almost forgotten.

The surveyed company operates in the cable industry, in which it is a pioneer in the Polish market, as it has over 30% market share. In addition to this company, there are about four larger shareholders and the rest of the entities are medium or small enterprises and there are quite a lot of them – 35. Most of the large shareholders have implemented Lean tools. The situation is different for smaller enterprises that rarely implement Lean concepts. This results from the lack of awareness of the possibility of such implementation in the specifics of cable production, but also from the lack of awareness of the efficiency of implementation that Lean gives (Horbal et al., 2011).

The surveyed enterprise is a Polish joint-stock company and a capital group. It is one of the largest cable manufacturers in Europe. The company produces copper and aluminum cables and wires, which are used in telecommunications, mining, shipbuilding, power engineering and the electronics industry. The case study refers to a branch of a company producing medium, high and extra high voltage power cables.

The 5S implementation project was prepared on the basis of the program of increasing production efficiency in the production plant adopted by the management. This project aimed to provide the necessary knowledge and tools in the field of Lean Manufacturing to operational employees and engineering and technical staff.

The analysis of the factory system by an external company indicated the existing problems and justified the need to implement the Lean Manufacturing concept. Irregularities that have been noticed by employees, and that are in favor for implementation are:

- 1) growing congestion in the factory, preventing the employees from performing their tasks efficiently,
- 2) wasting time in search of unnecessary tools, materials and information,
- 3) unneeded and unused items become a source of misunderstanding,
- 4) residual raw materials, ready products require space for storage and transport, wasting space and manpower,
- 5) employees perform too much unnecessary traffic on transport and searching for the necessary materials,
- 6) an adequate level of security is not ensured at the factory.

The decision to implement the 5S program was presented to employees in the form of a decision issued by the Plant's Director. It also included the decision to establish the Lean Manufacturing Council and the Supporting Team, as well as to appoint persons responsible for conducting the training and further maintaining the effectiveness of the 5S implementation.

Controlling the 5S system is the task of the Council and the Supporting Team. The most important role is played by people directly related to production, they are: Production Chiefs and Technologists, whose tasks are to organize, control and supervise the proper functioning of the 5S system in enterprises, that is, preparation, use and storage of documentation. In addition, organizing audits and analyzing their results, registering negligence of 5S practices by employees and further proceedings, improving the process of controlling and evaluating 5S. His tasks also include internal training in the company, preparing documentation of photographic implementation and development of 5S, diagnosing and solving problems related to 5S. All trained employees were required to implement 5S in their workplace. The results of the implementation were controlled by the Audit Team.

Office positions prior to the implementation of 5S were characterized by a lack of order, the documentation was laid out in various indeterminate and unspecified places. In the workplace, there were items that are not needed to perform it, such as paper clips, cables, corks, glasses. Access to electrical devices, i.e. the printer was hindered by unnecessary items. The offices also had chaos among the documentation, which was located in random places. There was a disorder in the positions, there was a risk of destroying the documentation or getting lost. Adopting a potential client in such office is associated with exposing the company's image. However, after the implementation of 5S, the tidiness of the office was much larger. Unnecessary items have disappeared and access to the most necessary devices such as a printer and a computer has been unlocked. Disaggregated documents disappeared from the post and found their place in the closet and were sorted in the right way. In such a position, you definitely work much better, and the acceptance of a potential client is not associated with the exposure of the company's bad image.

In the production managers' offices there was also a very big disorder before the implementation of 5S. The documentation was disordered despite the binder, and there were unnecessary items between the files. In front of the wardrobe you could see tools that should be found in specially designated places. They posed a threat to employees because it was possible to pour toxic liquids or turn over the employee. These items also blocked access to the wardrobe. You could also notice scattered clothes.

However, the positions of production managers after the implementation of 5S have become much more secure. The documents were ordered in binders and properly described. It was a very good idea to mark the cabinet in which there is documentation with red signs. Hazards that threaten the safety of workers have disappeared from the floor. Clothes strewn in wardrobes were also arranged.

The 5S method was also implemented at the production sites. Before implementation, you could see disorder. Only some shelves had signs indicating

what is in the container. The rest of the tools were in random places. The tools were mixed up, poured out of the packaging. In the place of storage of the finished product, there was a noticeable mess, unnecessary foils posing a threat to employees, also making it difficult to access cardboard containers, which are additionally placed in a random manner. Such organization reduces productivity and increases the time needed to find the required item by the employee. Figure 2 shows examples of process waste.



Figure 2. Examples of waste

Source: company documentation.

After the implementation of 5S, the stands were ordered and all the tools were in place and were additionally described and marked. The unnecessary items disappeared and found their place thanks to the “Red Cards” used in the first stage of the 5S method, i.e. selection. From the place of storage of the finished product, unnecessary items were removed, such as foils, empty cartons, etc. The filled cartons were arranged in an orderly manner and allowing access to each of them.

Such a stand is properly prepared for work. There is no need to find items, just reach for them from a marked container or place.

In addition, in the Quality Control Department, the storage locations for the test samples were described but there were no boundaries. Containers in which the waste was stored after the tests had an unsightly appearance and were not adapted to it.

However, after the implementation of 5S, the storage locations of the trials were marked with a blue tape delimiting the boundaries. The use of uniform and suitably adapted, described packages for other samples as well as waste allowed to organize the position and better organization of work. Figure 3 shows examples of the organization after 5S implementation.



Figure 3. Examples of work organization after 5S implementation

Source: company documentation.

In order to maintain the implemented principles of the 5S method, audits are carried out in the company. Not only for efficiency control by the Board, but also for the mobilization and motivation of employees to maintain their positions according to 5S and self-improvement. Every quarter, the Lean coordinator in the Department is elected. It sets the schedule of audits in the field of 5S, which are usually held every quarter, and are carried out by the Supporting Team. All locations where the 5S program has been implemented are analyzed. The results of audits are presented in the points that give the opportunity to compare several quarters, i.e. what areas are to be improved and which are still being improved. The 5S audit takes place at every “S” level. The sixth, or 6S, level has been added in the Department. The sixth “S” means maintaining safety in the workplace. Sample results of the audit, which was carried out on one of the production lines, are presented in Table 1.

S	Standard	Results (max. 100)
1S	Sort	50
2S	Set in order	67
3S	Shine	87,5
4S	Standardize	67
5S	Sustain	100
6S	Safety	100
sum		471,5

Table 1. The results of the 5S audit

Source: own study based on company documentation.

The results of the audit presented in Table 1 indicate problems primarily in Sort, Set in order and Standardize. However, very good results in Shine, Sustain and Safety. This may mean too little preparation of the employees to implement 5S methods at their positions. It shows that employees pay attention to cleaning or maintaining security, but do not see problems such as: too many unnecessary items, attachment culture, old habits. Obviously, the success of implementing and maintaining the effectiveness of the 5S tool depends primarily on the employees’ approach (Al-Aomar, 2011). That’s why the plant pays a lot of attention to it, applying the system of rewarding employees for the ideas and their implementation. In addition, in order to identify employees with the system in the company, Lean bulletins and information boards were created as well as a special Lean room, where employees meet, train and discuss. Table 2 presents a summary of the 5S implementation in the enterprise.

It is worth remembering that the key role in the manufacturing process is played by operational employees, whose knowledge and skills depend on the quality of the process. Extracting the hidden knowledge in it, developing it and leading it towards achieving the company’s goals is a key element of the 5S method (Tapping, 2007).

Table 2. Summary of activities in the implementation of 5S in the enterprise

Source: own study based on: Al-Aomar, R.A. (2011), "Applying 5S Lean Technology: An Infrastructure for Continuous Process Improvement", *International Journal of Mechanical, Aerospace, Industrial, Mechatronic and Manufacturing Engineering*, Vol. 5 No. 12, pp. 2645–2650.

Standard	Actions	Remarks
1S – Sort	<ul style="list-style-type: none"> • Classification of things at the workplace. • Identification of things needed and unnecessary. • Red card for non-related items. • Getting rid of old habits. 	„The power of habit” is still noticeable. Audits show, the employees didn't throw all unnecessary items.
2S – Set in order	<ul style="list-style-type: none"> • Place for each object. • Shelves for documents. • Containers for items on production. 	Lack of systematic ordering (e.g. by date). No containers for some samples. Placing objects makes it difficult to find.
3S – Shine	<ul style="list-style-type: none"> • Cleaning floors, shelves. • Removal of material remnants, foils, package. • Washing shelves, removing greases. 	Attention to cleaning on the production, removal of spilled greases, removal of packaging.
4S – Standardize	<ul style="list-style-type: none"> • Creation of 5S standards in offices and on production (located at workstation) • Control of accepted rules (e.g. audit) 	Employees had a problem in creating standards, this task often seems unnecessary to employees.
5S – Sustain	<ul style="list-style-type: none"> • Periodic meetings of employees. • Discussing 5S problems. • Constant building sense of belonging to company and to 5S system. 	The most important level. Audits show, Sustain is lead correctly by management.

The analysis of this case allowed identification of key factors that influenced the success of 5S implementation in the enterprise. They are mainly:

- 1) employment of an external company with many years of experience to implement Lean in the company,
- 2) deep analysis of the company's value system and indication of sources of waste,
- 3) training of employees by experienced consultants,
- 4) motivating employees by management to implement 5S through audits, assessments,
- 5) system for rewarding employees for ideas in the Lean area,
- 6) building Lean culture by management (bulletins, Lean rooms, systematic training).

Unfortunately, any project that engages such a large number of employees carries the possibility of failure. Similarly in the case analyzed and during the implementation the following problems appeared:

- 1) negative attitude of some employees to the new system,
- 2) problems in selection, resulting from the culture of employees' habits,

- 3) problems in standardization, resulting from the lack of employee involvement at this stage of 5S,
- 4) small commitment of management in some aspects related to Lean as communication, accountability.

Efficient of 5S in the enterprise is a thorough preparation for implementation. The key in the surveyed company was to hire an external company that supported employees with their experience, pointing out to areas in which it is particularly important to act. Thorough training and long-lasting preparation allowed for the implementation of 5S throughout the enterprise.

However, despite these aspects, there were various difficulties. At the beginning it was a negative attitude of employees against changes. During the implementation, the greatest problem was the strength of old habits. In addition, the lack of commitment to the standardization stage created. The organized position was a sufficient achievement for them and the standards were treated as unnecessary work. Fast L. has many years of Lean practices in the areas of the cable industry and points in the most important aspect in achieving the effectiveness of 5S implementation is communication, building standards, assignment of responsibilities, teamwork and accountability (Fast, 2016).

Communication includes explaining to employees what the management expects and what it will work on in the 5S area. Indication that 5S is not just a one-time cleaning, but a change in the organization of work. The standardization of work is an extremely important element in building the Lean environment. It is the commitment of all employees to building standards at every workplace. By rotating employees, create procedures for which no one has doubts and for which everyone agreed. Assignment of responsibilities is another very important aspect, which is often a problem among employees. Responsibilities should be divided according to the value stream and after discussion with the whole team, so as to develop a common and fair action plan. Teamwork is the next important step in implementing and maintaining 5S. It is primarily to build a culture of responsibility and belonging to the system. This gives a sense of the importance of the work for employees who are also involved in the positions of other employees and, if necessary, are able to replace them for a certain period of time. The last most important issue is accountability, an attribute that most employees lack. This is a problem that results in the lack of maintaining the implemented 5S rules for a longer time. Usually, the implemented rules are maintained for about a year, and then from the lack of responsibility by the higher management, which gives an example to all employees, the worked out rules are discontinued. A properly functioning 5S system, which will be effective in the long time, is one where violations of 5S rules are just as important as others and employees are instructed and punished. In addition, management must set an example to employees. The supervisor must reflect the principles that he expects from employees (Fast, 2016).

Working on these aspects will allow the surveyed company to maintain and improve the implemented 5S system. The management should pay attention to better communication with employees, individual conversations with them, building standards based on the analysis of positions by all employees, as well as building teamwork and Lean culture for the whole process and all positions. Additionally, it is extremely important to point to responsibility as a critical factor of success. Superiors must be an example for employees, because when supervisors disregard the standards created, the more employees will do it.

4. Conclusion

The main argument for the implementation of the 5S method was the elimination of wastage related to the lack of order in the workplace, i.e. better use of space, improvement of work productivity by organizing the position, improving communication, work ergonomics. In addition, attention was drawn to the expectations of recipients, whose decision is increasingly influenced by the visual assessment of the company and the neatness of work. The 5S system has become the first step to continuously improve the company, as well as became the foundation for the program to increase production efficiency, adopted by the company management.

The 5S method has been implemented throughout the enterprise. From office positions to production sites. This has undoubtedly improved the company's image, increased employee engagement, reduced waste and better use of employees' potential. Workstations have become more neat, clean and safer, which gave a sense of comfort to all participants of the organization. Thanks to such activities, the factory has cleaned up many places that previously caused disputes and uncomfortable working conditions. The implementation of the 5S concept, which is considered as simple and allows to achieve measurable effects in a low-cost way, also has its barriers. The biggest one is the dependence of the success of implementation on the employees of the entire organization, because it is necessary to change their mentality and thinking. Lack of teamwork, lack of a sense of belonging to the company, lack of leadership commitment, as well as building a psychological barrier between the management and production employees are the most common reasons for failure. Only overcoming these adversities leads to the expected results.

The indicated problems in selection and standardization can be solved by increasing the involvement of management, communication with employees and building teamwork. The indicated problems should be solved, because in the further future they can lead to the reduction of 5S efficiency in the company. The surveyed company indicates that in Polish culture it is extremely important to make employees aware and build their responsibility in the system through greater and more effective management involvement. The surveyed company may be an

example for other 5S implementing companies to pay special attention to the critical success factors and problems identified in this work.

The role of employees in the system is extremely important, because they are its main component. The philosophy of Lean assumes the creation of an enterprise in which the improvement of the organization is sought and thus a market advantage is achieved. The described company, undertaking the implementation of the 5S system, undertook a huge challenge. Not only related to the implementation method, which often turns out to be difficult, but above all a challenge related to the change of mentality of Polish employees. 5S is not only a purely technical issue that introduces visible changes in the organization of the company, it is a huge change in the thinking of employees, whose Polish mentality of collecting and fear of change is one of the main barriers to the successful implementation of the system.

Undoubtedly, the Lean Manufacturing philosophy is a kind of genius that meets the growing competitiveness on the global market. The created tools and methods allow for flexible adjustment of production and more effective management of the organization. These factors are of particular importance and are critical in today's economic system. The skillful use of the methods proposed by Japanese practitioners allows enterprises to effectively improve their competitiveness by producing value-added directly attributable to the client.

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