

IMPLEMENTATION OF LEAN 5S METHODOLOGY IN LOGISTIC ENTERPRISE

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Abstract: The Japanese 5S method is the basis for optimizing processes in the enterprises. An example of the practices in the logistics enterprise is presented. These practices are an important prerequisite for successful work in the enterprise and have a positive impact on the implementation of the 5S system and other methods. 5S contributes to the development of the learning organization with employees. 5S practise is one of the techniques to improve quality and safety and health at the workplace. It was first popularized by Taiichi Ohno, who designed the Toyota Production System and Shigeo Shingo, who also put forward the concept of poka-yoke. The article presents Lean 5S methodology and selected results of research on performance and interference, before and after implementation of the 5S method in the logistic enterprise. The purpose of this paper is to implement the 5S and principles to assist manufacturing organisations to become more efficient and more productive. The case study presented in the paper will be useful to researchers, professionals and others concerned with this subject to understand the significance of 5S and Lean.

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1. INTRODUCTION

Implementing the Far East management concepts does not benefit day by day, it does not improve productivity and quality immediately, because too many variables decide on success. The idea of Lean systems is to continually improve the production process, and as the result, to maximize productivity and to minimize resources consumption (Abhishek, Rajbir & Harwinder, 2014; Bednarek, 2007; Bernais, Ingram & Kraśnicka, 2007; Czerska, 2011; Imai, 2007; Knop & Selejak, 2012; Liker, 2009; Likert 2005).

The process should be understood as an ordered sequence of events in the organization with its systematics at every level of the organization. This space is penetrated by a properly qualified and motivated human factor, according to the principle that "every organization is the same as the people who create it" (Wojtynek, 2009).

This method evolves successively as it is supplemented by new tools and techniques, including: JIT – „just in time” production method, TQM – „total quality management”, SMED – method of reduction of machine rearming time, Kanban Card – method of controlling the flow of production, Kaizen – continuous improvement, 5S – the order maintenance system, TPM – the machine maintenance system (Bernais, Ingram & Kraśnicka, 2007; Liker, 2009; Liker, 2005; Wojtynek, 2010).

Constant changes in global market conditions force manufacturers to modify and improve this approaches towards business management. One of them is the Kaizen philosophy, which has its foundation in the Japanese management practice (Bernais, Ingram & Kraśnicka, 2007; Imai, 2007).

According to Kaizen principles, progress or improvement are not only about product or service, but the system as a whole, that is–the organization. This management philosophy is a continuous process of improving each element of the production path (Wojtynek, 2013). Counteracting of the mass, automated production, which aims to meet the minimum needs of the consumer, is the right approach in the client-oriented market era. Companies that use Lean principles in their structure minimize production costs by reducing the consumption of raw materials, intermediates, energy, time and manpower.

Minimizing quality costs is a key feature of quality management systems and they are based on 5S practices. They allow the company to maintain high

productivity, quality, to minimize costs, optimize timely delivery, improve work safety, improve satisfaction and value of employees.

The lack of major risk areas in the implementation of the 5S concept makes it a universal method. It made a step outside the framework of existing management methods. The main goal, along with a profit, became the development and maintenance of a motivated team, as well as the fulfilment of the individual ambition of the employees, while pursuing the strategic tasks of the company.

2. METHODOLOGY LEAN 5S

According to the Lean concept, anything that does not create value added is a waste and shall be considered accordingly. The process of implementation of the Lean Management in the enterprise is shown in Figure 1 (Abhishek, Rajbir & Harwinder, 2014; Knop & Selejak, 2012; Wojtynek 2010; Wojtynek, 2013). Figure 2 presents a simplified model of conduct in 5S concept.

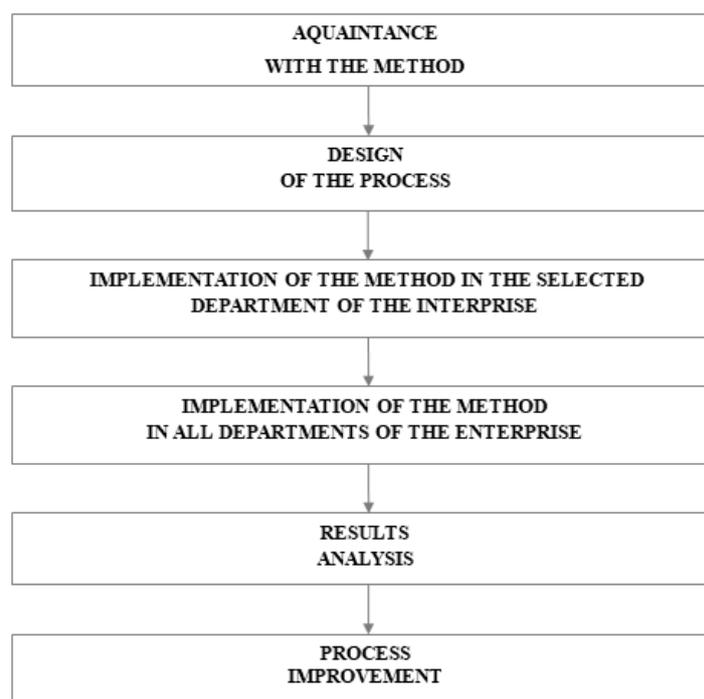


Fig. 1. Stages of implementing the Lean Management concept in the enterprise (Abhishek, Rajbir & Harwinder, 2014; Bernais, Ingram & Krašnicka, 2007; Knop & Selejak, 2012)

Lean Management is implemented in the first place. The action plan, with the help of the implementation team, is being developed. It is important to train, prepare and motivate the team implementing the concept to make changes. A process transformation model is developed when designing this process. Acceptance of the appointed group is necessary. The partial introduction phase in a particular area requires employees to use the 5S method at all workstations. The efficiency of the implementation of this concept depends on the information system in the enterprise. Ensuring professional training in the field of the implemented activities and making employees aware of the possibilities of improving the production process in the whole production area is important.

Employees are informed about the progress that has occurred since the use of lean production. The Lean concept draws attention to the knowledge and experience of the staff. Employees should indicate their ideas and skills. This is important in the future in terms of improving ergonomics of workplaces, improving work in the manufacturing sphere. The help system is a suggestion system (Abhishek, Rajbir & Harwinder, 2014; Bernais, Ingram & Kraśnicka, 2007; Knop & Selejak, 2012; Veli-Pekka Pirttijoki, 2013; Pacana, 2016).

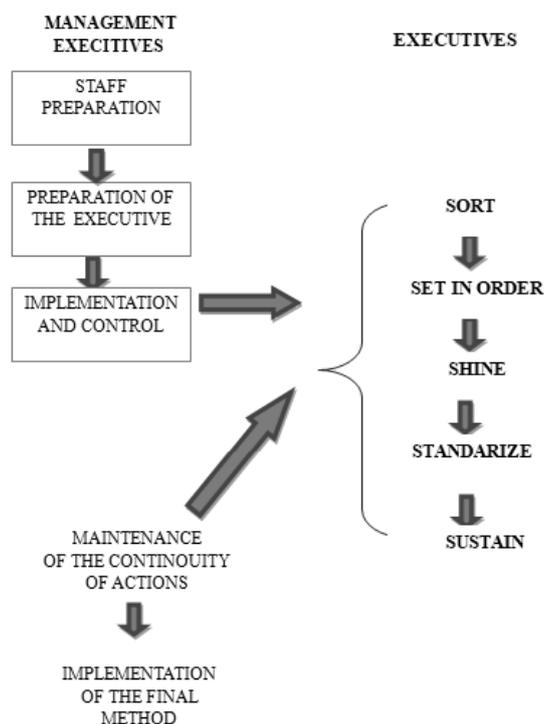


Fig. 2. Simplified model of conduct in 5S concept (Abhishek, Rajbir & Harwinder, 2014; Bernais, Ingram & Kraśnicka, 2007; Knop & Selejak, 2012)

Seiri – Sorting and prioritizing: going through all the tools, materials, etc., in the work area and keeping only the essential items. Everything else is stored or discarded.

Seiton – Straighten or set in order: Focuses on efficiency, by arranging the tools, equipment, visual dashboards and parts in a manner that promotes workflow. For everything there should be place and everything should be in its place.

Seisō – Shining or cleanliness: Systematic cleaning, or the need to keep the workplace clean as well as neat. At the end of each shift, the work area is cleaned up and everything is restored to its place.

Seiketsu – Standardizing: aligning work practices, or operating in a consistent and consistent fashion. Everyone knows exactly what his or her responsibilities are to keep above the previous three S's.

Shitsuke – sustaining the discipline: Maintaining and reviewing standards. Once the previous four S's have been established, they become the new way to operate (Veli-Pekka Pirttijoki 2013; Pacana, 2016).

Analyzed research entity offers high-quality components and kits for the production of trailers and semitrailers. It also deals with their distribution. The main recipients are truck manufacturers.

As a part of the production process, the following processes can be specified: profile cutting, lacquering, welding, wall mounting, roof mounting, loading, reception, storage and pre-treatment of plates, inspection and complaint handling. It is assumed to produce a specific item in an effective manner, in accordance with customer requirements. The time of interruptions, and thus costs is minimized. The main goal is to achieve maximum customer satisfaction and implement improvement actions. Each process consists of input and output data. The monitored indicators are determined for each process along with expected values. Processes of: profile cutting, lacquering, welding, roof and wall installation and loading of goods begin with pre-planning and continue until delivery of the finished product to the place of storage. Processes of: reception, storage and pre-treatment of the plates begin at the time of delivery and continue until the prepared plate is delivered to mounting department.

Audits and training are a key element in the implementation of the 5S method. They take place according to a fixed schedule. They allow for methodical work and continuous control of the implementation process. Staff is informed of further projects to ensure the maximum level of acceptance of changes. Trainings are conducted twice a week, alternating between the two selected divisions of the company. Audits are combined with staff training. They are also held twice a week. The methodological tool for conducting a 5S audit is a multi-stage control card. Unnecessary objects are eliminated from the workplace. Red cards are used to identify redundant items. There are designated places to store things recognized as dispensable. Points are allocated according to the number of elements.

Access to machines and equipment is checked. The location of the tool storage for mounting and setting the tool tables is determined. The purity of the machines,

equipment and measuring means is taken into account. People who participate in the audit themselves assess the degree of contamination of each component. The availability of all information boards (instructions: OSH, quality system, production plan, work instructions, cleaning plan), as well as the tasks included in the previous audit, are controlled. Upon completion of the audit, the analysis shall be carried out, the points shall be calculated, showing where the sections of the implementation of the 5S concept are located in each chapter. After each check a so-called "to-do" list is created. It specifies the items that need to be improved along with the date of their completion. The implementation of the 5S method is intended to improve the working conditions, safety, performance and quality of manufactured products.

The effect of the implementation of the 5S concept in the examined subject is assignment and location of each element in a designated place, because too many materials can cause: injury, loss of components, difficulty in reaching the machines and equipment. Soiled machines, devices, production materials are one of the main reasons for lower productivity, quality and machines downtime. Renewal of the instruments allows to increase the efficiency of work, reducing the risk of malfunction and interference. Deficiencies in materials and tools cause more distortion and slow down the production process. Unnecessary items on the workstation or in the surrounding environment can cause injury, pollution, lost equipment, difficulty accessing tools. An important element of the analysis of the implementation of 5S in the company is the graphical display of the results of this process on the information board. It is located in the main communication line of the company. It specifies: the schedule of trainings and audits, audit results, monthly performance graphs, suggestion system. This method helps to increase employee awareness and illustrates the positive effects of implementing the 5S concept.

Two-day Gemba Kaizen supports the implementation of the 5S system in the enterprise. In the first stage/day of Gemba Kaizen training of the group involved in the process takes place. Employees are made aware of the benefits that the enterprise and employees will reach by the implementation and application of the 5S method at workplace and in its surroundings. The group of people involved in the training is divided into smaller teams. An action plan is created to improve the work and eliminate unnecessary items in the production process. The attention was focused on the following areas: doors mounting and installation of roofs.

At the second stage/day the planned activities are implemented in practice. In the process of manufacturing, production workers are involved, as well as executives. Gemba Kaizen results in greater employee awareness of the positive aspects of the implementation of the 5S concept and a noticeable degree of acceptance of changes occurring in the enterprise by employees (Palonka, 2010).

3. RESEARCH RESULTS ANALYSIS

Business performance testing is a key element of control and rapid response to deviations from the adopted standard. Improper work organization, lack of production fluidity and bottlenecks resulted in the company's performance degradation. The reason for the interruptions were: long time of rebuilding machines, searching for instruments and waiting for the finished products from the warehouse or from the production process.

The article presents selected results of research on performance and interference, before and after implementation of the 5S method in the examined enterprise (Table 1).

Table 1. Analysis of business performance and interference

Months	Research results before 5S method implementation		Research results after 5S method implementation	
	Performance [%]	Interference [%]	Performance [%]	Interference [%]
1	74.28	1.45	107.23	0.00
2	83.37	1.62	114.18	4.56
3	100.67	9.28	104.60	1.46
4	72.92	25.93	108.12	3.16
5	83.86	5.00	91.62	4.12
6	88.19	16.69	121.31	2.03
7	87.76	15.91	128.16	0.00
8	89.07	11.33	106.14	3.16
9	100.17	3.92	113.83	2.72
10	97.92	7.53	100.97	9.77
11	82.14	13.03	101.71	5.48
12	92.72	20.96	106.12	1.47
Median	87.75	11.05	108.66	3.16

Analysis of the data presented in Table 1, allows to observe minimization of interferences after the implementation of 5S method. Research indicates improved capacity and consequently, increased performance.

By analyzing the results of the research it can be stated that, as a result of the implementation of the 5S concept, the company has achieved the expected values, ie: 100% performance, 100% of plan implementation, 12 products produced per shift, 0 complaints, interferences level is $\leq 5\%$.

Development of a 5S implementation schedule has led to improvements in the manufacturing process, reducing material losses, that increased mounting efficiency. With the 5S training, greater employee engagement has been achieved, and resulted in increased productivity.

Analysis of the criterious showed an upward trend in the area of weekly implementation of the plan. In most cases, the plan performance exceeded 100%.

This is the reason for making workers in other areas aware of and encourage to take steps to implement the 5S method. The number of daytime sets grew to the expected ceiling of 12 pieces per shift. This resulted in an increase in production liquidity, as well as an accelerated delivery date. Prior to the implementation of the 5S method, the number of complaints was higher due to defects in product design, poor quality, lack of awareness among employees of errors in the production process or failure to deliver on time. The 5S system has helped to streamline the process. As a consequence, the number of incoming complaints decreased by 30%. Interferences during the process has been minimized to 5%. Priority was given to greater involvement of all employees, better communication between particular areas, increased control of electrical equipment and improved production liquidity.

4. CONCLUSIONS

The management concept for an organization is not a matter of imposing certain forms, procedures, management styles, or copying certain schemes. This process is the result of long-term strategy and hard work. Time and effort devoted to implementing and maintaining effective management methods is profitable. It resembles a win-win situation where all parties are satisfied. Employees are satisfied that they work in ergonomic, clean, safe space. This transfers into their motivation. The customer receives a product or service of high quality, that meets his or her needs. Entrepreneur gains business profit and satisfaction from the risks taken and the personal development of employees and businesses. Going beyond the traditional, profit-oriented by all means, way of managing has taken a tremendous leap forward in the sense of a broadly understood business and a living, space in which apart from financial satisfaction, what matters is also the development, maintenance of a motivated team, fulfillment of individual employees' ambition while fulfilling the strategic tasks of the organization

On the basis of the case study, it can be stated that introducing the 5S and Lean rules brings great changes in the organisation, for example, increasing of effectiveness and efficiency in the processes, improved visibility of the process, improved morale and safety of the employees, reduced delays, searching time and dangerous conditions. 5S and Lean is a powerful tool and can be implemented in any industry. Implementation of 5S and Lean has large horizontal development and they can be implemented in all the workstations of the organisation. The 5S and Lean method begins each programme of improvement in the enterprises. Its result is the effective organisation of the workplace.

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