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TEXTILE INDUSTRY APPLICATION OF THE 5S METHOD

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Abstract: *The paper presents the 5S method, developed to ensure ergonomics in the workplace, productivity growth, reducing defects and increasing cleaning. 5S is a fundamental tool to promote continuous improvement process in organizations and represents a transformation in 5 steps of a job, which is characterized by maximum efficiency at the micro level and minimum loss. The tools which can be used for implementing could be the Kaizen circles for training, analysis and implementation, as well as visual elements, posters or graphics. The 5 phases are Seiri, Seiton, Seiso, Seiketsu and Shitsuke, which can be translate as Sort, Set in order, Scrub, Standardize, and Sustain, focusing on orderliness and being applied especially in Japanese factories. The stages includes inputs objectives related to the efficiency and effectiveness of the process, but also subjective, which refers to moral values, education, training, culture. For each S stage, the most important elements which are underlying the implementation and maintain the compliance are described. Any company that applied the 5S program will have quick and visible results, reducing different types of waste. The final section presents a case study and some rules in order to sustain the designed standards and implement a continuous quality improvement. The concluding remarks could be considered as work instructions in order to implement the 5S rules.*

Key words: *TPS, kaizen, clothing industry, visual control*

1. INTRODUCTION

The 5S method was created and developed in Japan, as an important part of the Toyota Production System (TPS). This system was promoted by two Japanese experts, Osada and Hirano, as a way to keep the workspace clean, tidy and accessible, influencing self-esteem and morale [1]. Hiroyuki Hirano, in a case study on manufacturing systems, had firstly integrated production data and many western managers have considered that the phenomenon belongs to rational knowledge. In practice, the management is always based on the development of production and best practice elements and Hirano developed a structure for improving, a knowledge based production development management system. He pointed out a number of steps that can be identified, each being based on the previous one [2].

,, *Quality starts with yourself*" is the motto and as far as we know, the proper functioning base of a company are the trust and the climate of the working environment. The confidence is developing if each employee carries out correctly his duties and respects the existing rules. If there is certainty that each individual will do the right thing, the next step of the analysis is done more efficiently and with confidence. Quality begins with people and therefore, with order and cleanliness, that one can use the 5S methodologies to reach a high quality level.

5S is a fundamental tool to promote continuous improvement process in organizations and represents a transformation in 5 steps of a job, which is characterized by maximum efficiency at the micro level and minimum loss. The system creates an environment where all objects are easier to find and any deviation from the normal situation becomes apparent by visual management methods. In the same time, 5S techniques maintain quality, promote a significant costs reduction by eliminating the losses and provides the best framework for progress throughout the organization.

The 5 phases are *Seiri, Seiton, Seiso, Seiketsu* and *Shitsuke*, which can be translate as Sort, Set in order, Scrub, Standardize, and Sustain, focusing on orderliness and being applied especially in Japanese factories. There are several variants of the 5S method. Some are simpler and shorter, as other situations involve complex studies on a longer period of time and more space. In some companies, the 6th S is added – the Safety step, combining orderliness with safety and being described by clean, safe, and orderly. There are other phases as security and satisfaction that could be added, enhancing the consciousness. Originally, Toyota adopted a 4 phase system, the concept of "self discipline" or "sustain" being traditionally embedded in the Japanese culture.

2. A SHORT DESCRIPTION OF THE METHOD

Each stage includes inputs objectives related to the efficiency and effectiveness of the process, but also subjective, which refers to moral values, education, training, culture. Initial implementation should be fast and simple, which lasts one or two days, followed by a second phase a few months later by applying specific techniques. First, the focus is on selecting, cleaning and handiness of an individual workplace, so it can be seen improving the efficiency and effectiveness of a specific activity. Then, basic standardization for maintaining the initial situation is designed, and a Steering Committee for sustaining the activities is established. The 5S Teams must have 5 to 12 members, who work in the same sector of the department, while the Steering Committee is formed by 10 persons from all stages and levels. The 5S coordinator assists the teams and completes the policies of the Steering Committee.

The tools which can be used for implementing could be the Kaizen circles for training, analysis and implementation, as well as visual elements, posters or graphics, which are Visual Control tools also [3]. For each S stage, the most important elements which are underlying the implementation and maintain the compliance are presented [4].

2.1. Sort

To sort and classify means to divide and arrange according to type, size, categories or frequency of use, labeling with different colors (green, yellow, red, blue) and place in special locations. To achieve a high classification, it must begin to classify based on:

- What should you need and why?
- What is needed, why is it necessary?
- What is sufficiently, why is excessive? (to reduce costs)

In offices, halls, warehouses or shelves, more items than can be normally used are found in a disorderly manner. By classifying tools and objects, the following advantages can be observed:

- unoccupied spaces can be used for different purposes
- reducing of closets and shelves agglomeration etc.
- disposal of used items, thereby controlling the use lifetime
- elimination of spare parts for older models
- eliminating long storage time in inventory
- avoiding excessive inventories and unnecessary movements
- eliminating unnecessary costs.

2.2. Set in Order

To organize is to set in order a group of objects, to establish a rational, methodical and systematic order of all production elements (furniture, equipment, documents) with the aim to always have the necessary amount when they are needed. The organization is achieved in the following guidelines:

Fix a storage location (decide where things are preserved), with the steps:

- removal of unnecessary things
- selecting a classification and organization of the deposit
- standardization of elements titles - labels

Set-up a storage method (decide how to keep things), with the points:

- choose an appropriate method for storage type
- display the items titles
- facilitate storage and remove items

Maintain the regulations respecting the storage type, with the key points:

- daily control (not to be lack of material)
- improving of procedures
- training enhances efficiency for storage and disposal actions

For unnecessary objects, a central red area is fixed. Things that can be used in the future will be placed near the work place and the absolutely necessary elements are placed into the workplace.

2.3. Scrub

The implementation of 5S cleanliness is the first step to a flawlessly job and is obtained by removing what is not necessary to the workplace and keeping everything in the best possible state, based on maintenance and constant care.

There are 4 steps to implement the Scrub step:

Step 1: Divide the areas / roles or responsibilities
Step 2: Implement the cleaning by teams/on areas
Step 3: Find improvements
Step 4: Define regulations to improve

The instructions for maintaining cleanliness are:

1. Clean before starting to work;
2. Before leaving, set in order and clean: removing garbage, what is not necessary to ease general cleaning, rearrange each object in place;
3. Use appropriate places and remove garbage containers;
4. Create a custom for previous points: first cleaning the work place, then the equipment, the department and the company.

2.4. Standardization

Standardization denotes fixing specifications, using rules and procedures. Standardization is the key to maintain high standards of efficiency at work, ensuring visibility in the workplace can guarantee that the necessary measures are taken immediately. It is necessary that all employees, from management to operators are informed on the methodology of 5S and have at their disposal all the required information. There must be a communication between different departments of the company, in order to leverage the interest of all those who are not convinced [5].

Standardization of 5S activities refers to normal working activities and consists in developing work instructions: color schemes, aisle marking, cleanliness standards and cleaning schedules.

2.5. Sustain

Sustainment is usually the most difficult part of 5S. For a good sustenance and discipline, there are some aspects to improve:

• Understand the ,,empathy" concept as the ability to imagine you could be in that situation
• Develop collegiality at work, and share information with others
• Create conditions for each employee to apply what he had learned

All activities and attitudes should be standardized and repeated until they get to be part of the company culture. It is an eminently a human stage that can not be automated [6].

2.6. Conclusion

A 5S program can not be implemented without the commitment and responsibility of employers and employees. There are conditions necessary but not sufficient to be provided, such as:

- The employee must respect the following rules: compliance with personal hygiene, maintaining adequately the equipment and cleaning, not using alcohol, tobacco or similar substances, supply a correct hygienic environment, use an appropriate behavior in the workplace, benefit from adequate rest and sleep, positive attitude, compliance with regular medical examination, maintain a healthy life, recreation etc. and compliance with safety.
- The company must provide suitable working conditions and maintaining cleanness in appropriate conditions of a healthy environment: cleaning facilities, adequate lighting, eliminating excessive and harmful noise, subdivision of excessive noise areas, removing unwanted and toxic odors (smoke and dust), removing unwanted vibrations, and maintaining a pleasant working environment.

3. CASE STUDY

We have performed a case study in one of the departments of a garment factory. The steps of the 5S method for the organization of the work place have been followed and examples of good practices will be presented. The following remarks could be considered as work instructions in order to implement the 5S rules. For the Sustain stage, some operations have been watched over a period of 9 weeks, with daily records at the end of working hours.

Storage areas have been identified using marking with colored lines. Thus, for the finished products, the color used is green. In the case of nonconformities, defects or quarantined products, the area was flagged with red, and for waiting areas or packaging materials, we used blue. Crossing areas are marked by yellow lines. Figure 1 shows an example of complex correct marking.

***Fig. 1**: Floor marking for different areas*

The floor lines must be visible and undamaged, respected and maintained by the work team. Figure 2 shows to examples of conform and nonconforming marks.

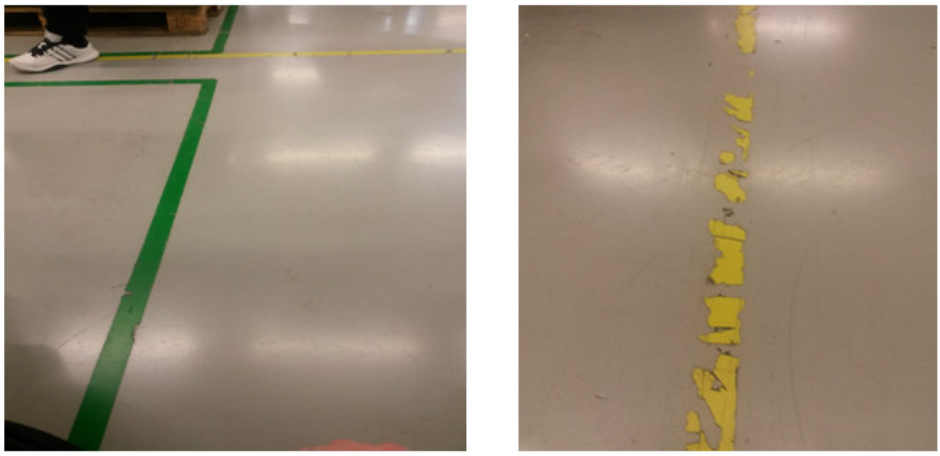

***Fig. 2**. Conforming and non conforming aisle markings*

The storage cases used in the production facility have the following color coding and function:

- Red cases contain non-conforming products and are placed on the red marked areas
- Grey folding cases and blue ones containing finished products are stored on the spaces marked in green
- Large blue or grey cases are containing raw materials or components and have been placed on shelves or spaces marked in blue

All cases must be identified by standard labels, as shown in figure 3. The pools and cases must be clean and free from dust or other foreign objects. The products stored in grey pools and cases should not exceed the established height as this can lead to product mix or their contamination in the case of falling. The grey storage cases that have passed the metal detector must be covered with a cardboard or cover (if applicable) to prevent the fall of foreign objects and their contamination.

Broom and dustpan must always be stored on the standard panel for cleaning tools and arranged as presented in figure 5. The scissors and pencils must be mandatory attached together, while the metal rulers kept in optimal conditions, calibrated and store in their designated storage place. The dummy check for the metal detector, used in order to avoid product contamination with dangerous

objects, needs to be calibrated and in good working order. Scissors must be attached to the work place, with a blunt tip to avoid puncturing the material.

***Fig. 3**: Grey folding cases for finished products*

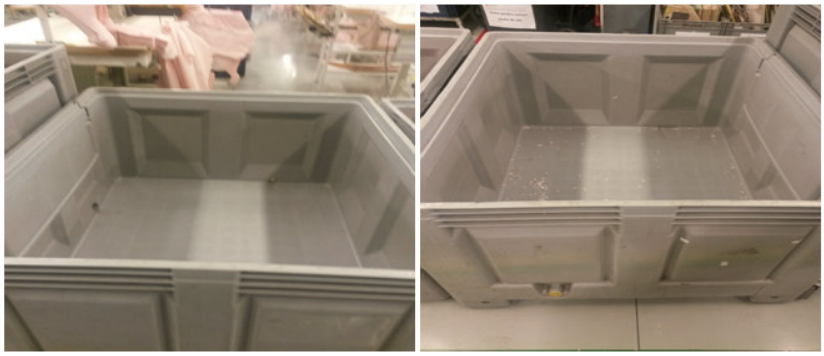

***Fig. 4**: Conform and nonconforming pools*

***Fig. 5**: Correct and incorrect positioning of cleaning tools*

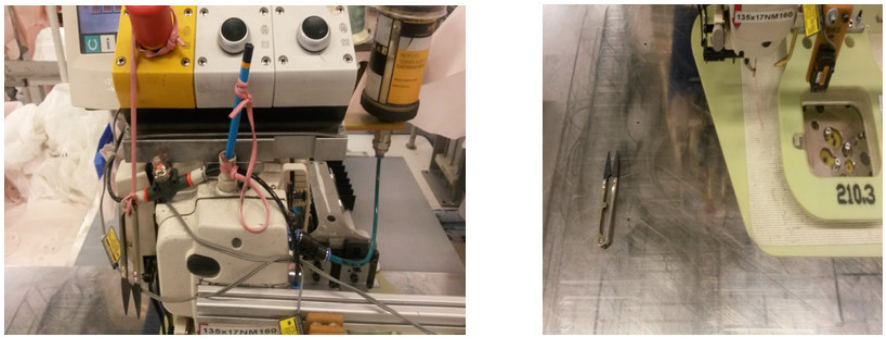

***Fig. 6**: Conforming and nonconforming storage of scissors*

In order to sustain the 5S rules, the placement of cleaning tools and grey cases have been monitored during 9 weeks, with everyday sampling. Graphics in figure 7 presents the percentage of

correct positioning for each week as a average value. The responsibility and awareness of the operators regarding the 5S rules have shown some improvement along the observed period of time.

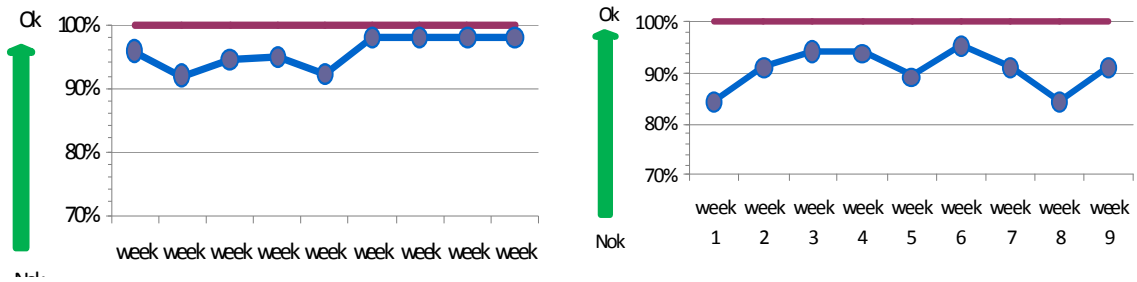

***Fig. 7**: Percentage of correct positioning of a) cleaning tools and b) product grey cases*

4. CONCLUSIONS

5S can be considered a philosophy, a way of life, which can raise the morale and create a good impression to customers and enhance the efficiency. Any company that applied the 5S program will have quick and visible results, reducing different types of waste, in respect of lean manufacturing principles, removing all the forms of waste from the value stream (cycle time, labor, materials, and energy).

The benefits of applying this method in the company are the following:

- support the timely delivery;
- improve the products quality and reduce the number of defects;
- increase the productivity;
- reduce the loss of material, time and space (prevents waste);
- reduce the warehousing and inventory costs;
- reduce the downtime due to equipment malfunction;
- increase employment security.

The employees will feel more comfortable at work and the continuous improvement actions will lead to less waste and better quality, affecting the company's profitability and competitiveness.

REFERENCES

[1] H. Hirano, *"5 Pillars of the Visual Workplace"*, Cambridge, MA: Productivity Press, ISBN 978-1-56327-047-5, 1995.

[2] T. Osada, *"The 5S's: Five keys to a Total Quality Environment"*, US: Asian Productivity Organization, ISBN 9283311167, 1995.

[3] M. Caravaggio, *"Total Productive Maintenance"*, in Levinson, William (editor), Leading the Way to Competitive Excellence: The Harris Mountaintop Case Study, Milwaukee, WI: ASQ Quality Press, 1998

[4] M. Titu, C. Oprean, D. Grecu, *"Applying the Kaizen Method and the 5S Technique in the Activity of Post-Sale Services in th Knowledge-Based Organization"*, Proceedings of International MultiConference of Engineers and Computer Scientists, vol. III, Hong Kong, 2010

[5] J. Michalska, D. Szewieczek, *"The 5S methodology as a tool for improving the organisation*", JAMME Journal, vol. 24, iss. 2, October 2007

[6] A. Bayo-Moriones, A. Bello-Pintado, J. Merino-Díaz de Cerio, *"5S use in manufacturing plants: contextual factors and impact on operating performance"*, International Journal of Quality & Reliability Management, vol. 27, iss. 2, pp. 217 – 230, 2010