The 5S lean method as a tool of industrial management performances

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Abstract. Implementing the 5S (seiri, seiton, seiso, seiketsu, and shitsuke) method is carried out through a significant study whose purpose to analyse and deployment the management performance in order to emphasize the problems and working mistakes, reducing waste (stationary and waiting times), flow transparency, storage areas by properly marking and labelling, establishing standards work (everyone knows exactly where are the necessary things), safety and ergonomic working places (the health of all employees). The study describes the impact of the 5S lean method implemented to storing, cleaning, developing and sustaining a production working place from an industrial company. In order to check and sustain the 5S process, it is needed to use an internal audit, called “5S audit”. Implementing the 5S methodology requires organization and safety of the working process, properly marking and labelling of the working place, and audits to establish the work in progress and to maintain the improved activities.

1. Introduction
By permanent changing and improving of the current development conditions of the industrial companies, the implementation of framework management methods it is required in order to measure the performance of industrial processes [1]. One of the essential steps to set in motion and bring about a flourishing lean culture, as well as one of the most widely adopted method from the lean manufacturing toolbox, the 5S method is considered a basic lean concept, as it establishes the operational stability required for making and sustaining continuous improvements [2, 3, 4]. The 5S lean is a method to improve efficiencies and enhance the management performance [5]. The 5S is the methodology of creating and maintaining well organized, clean, high effective and high quality workplace. Its result is the effective organization of the workplace, reduction of work environment, elimination of losses connected with failures and breaks, improvement of the quality and safety of work [6, 7, 8, 9]. In Japanese, 5S is the short form of five words which represent the concept of good maintenance [10]. The 5S has the following significance [11, 12, 13, 14]:

- Sort (Seiri) – decide and separate or remove the unnecessary things by the necessary tools;
- Set in order (Seiton) – putting in a logical order each item most often used in a properly place and storage out those in a well-established location;
- Shine (Seison) – perform and maintaining a deep cleaning, eliminate sources of dirt and simplify cleaning process, quality can be obtained only in clean working environments;
- Standardize (Seiketsu) – establishing rules and storage areas by making simple visual rules along with training of maintain standards to reduce search time and avoid mistakes;
- Sustain (Shitsuke) – all activities should be monitored, evaluated and continuously improved in order to respect and maintain the results achieved through the implementation of 5S method. Implementing the 5S method should begin from trainings of productive workers in the range of the 5S’s elements and advantages from their usage. Very important fact is that these method do not refer only to the productive positions, but also refer to the warehouse, office positions and others [6, 15, 16, 17, 18].

One of the main purposes of the 5S is to prepare the work environment to hold visual information. From that perspective, 5S is a method, while creating a visual workplace is the goal. So, 5S and visual management go hand in hand [2]. Visual management method assumes that by a simple observation, in maximum five minutes, it can be view the existing situation on which to establish a quick action plan to improve the entire production process [12, 19].

2. Tools of implementing the 5S lean method
The 5S audit is a standard tool used for periodical or permanent reviewing and verification of the 5S method. Development, implementation and continuous monitoring of the 5S implementation is the lean management responsibility and not the auditor. Following a 5S audit evaluation, it can examine if the situation has improved or has worsened against previous auditing [20].

Another tool used to implement the 5S lean method is a standard sheet created to be used in marking the production areas (table 1).

Table 1. Standard of marking the production areas.

| Role | Delineates the walkways | Delineates the storage areas of the processing parts | Delineates the storage areas of finished parts | Delineates the storage areas of rework parts | Delineates the storage areas of rejected parts | Delineates the storage areas of waste products | Delineates the storage areas of trolleys, carriages, boxes, devices, molds | Delineates the dangerous areas | Delineates the fire extinguishers areas |
|------|-------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|
| Marking colors | ![Gray color](image) | ![Yellow color](image) | ![Green color](image) | ![Dark blue color](image) | ![Red color](image) | ![Blue color](image) | ![Orange color](image) | ![Pink color](image) | ![Black color](image) |

The 5S method implementation supposes establishing some tasks and responsibilities for the team involved in compliance the specific process activities. After establish the specific tasks and responsibilities of implementing the 5S, it was required to drawing the standardization form to do the process confirmation to all workplace (automated and manuals), as a tool in implementing the 5S.

3. Implementing the 5S method
The purpose of the study presented in this paper was to identify, analyze and implement the 5S method in an industrial company “A”. To do this, in the company “A” held on a workshop where were attended the production area manager, the production preparation responsible, the foreman, the shop leader and workers. The 5S workshop was led in the lean management department of company “A”.

Objectives of the 5S study imply:
• Preparing the 5S standard catalogue and implementing the standards;
• Clear tasks and responsibilities for the 5S team and the lean expert;
• Informing the team about the established tasks and responsibilities;
• Training the foreman and the shop leader regarding the implementation of the 5S standards;
• Achieving the 5S audit according to the established standard;
• Developing and continuous improvement of processes and workplaces;
• Drafting the standardization form of the process work;
• Performing the process confirmation of the workplaces according to the drawing standard form;
• Permanent update of the 5S standard catalogue.
3.1. Sorting
Sorting supposed to check all the area, even the most inaccessible, netherworld, behind, above the machines or tables etc., for separation the unnecessary things of the required and necessary tools. At the time of implementing sorting process, have addressed and asked the following questions: Why is needed of...?; Who needs the...?; How often is needed of...?; When was the last time I needed of...?

Based on answers of these questions, things were sorted on necessary and unnecessary tools. The unnecessary tools were removed and workplaces were released from the disturbing things.

3.2. Set in order
Set in order process required as the necessary things to be put in order at the working places. Once identified how often and why it is used each tools, was followed to have: all things needed and used constantly to be easily find and be easily accessible, all things that are not immediately needed are elsewhere stored, tools who are together used (by several operators), must stand together, and everything has its place.

Things used occasionally and seldom have been storage on the workplace but outside the direct using sphere. Their distance and location from the place of work depend on the frequency of using these materials or tools. Places of storage were marked in the manner to making possible their quick identification. For this, have been used colours from the standard sheet created to marking the production areas, and signs or tool boards. Once defined the places and methods of storage, these should be invariable. After implementing the second S’s, all things and necessary tools were properly arranged for a quick usage and so, were shortened the time of preparing the workplace.

3.3. Shine
Quality can be achieved only in clean environments. Regular cleaning permits to identify and eliminate sources of disorder and to maintain the clean workplaces. During cleaning it is checked the cleanness of machine, workplace and floor, tightness of equipment, cleanness of lines, pipes, sources of light, current data, legibility and comprehensibility of delivered information etc. Indispensable is also taking care of and maintenance the personal tidiness of the operator [6].

Based on third S’s implementation, all the work area and machines are maintained in cleanness and the work conditions are tidy and safe.

3.4. Standardize
Based on standard sheet of marking the production areas, has been achieved the standardization of (and not only): storage areas (make more transparent the stock levels), materials and working tools (decreases the spent time of their search), supporting materials (is reducing the possibility of their mixing and the searching time), tool trolleys (leads to an organized labour), personal things (maintain order and the employee’s satisfaction), rejected and reprocessed parts (reduce errors that can occur by mixing parts), cleaning tools (improve access).

To sustain the standardization process was drawing the standard form by which is doing the process confirmation of all workplaces (figure 1). The standardization form helps keeping safety and quality rules, sequence of working steps, and process performances.

The 5S method and process confirmation connection involve some targets and principles:
• Go, see, understand the way, and how the working process is being executed;
• Observe the process for longer time, identify the waste, and the way to eliminate or reduce it;
• Identify deviations from standard and compare with the existing and trained standard;
• Inform the worker why you are there and discuss deviation before tells your observation;
• Give feedback what you observed (feedback is without blaming the worker);
• Agree with him on the next steps and on his role in it;
• What you promised, you should keep (implementation).
3.5. Sustain
Sustaining suppose:
• Monitoring the compliance of rules;
• Periodical checking and updating the 5S standards;
• Immediately implement measures when are finding deviations from the 5S standard;
• Periodically control by specific 5S checklist and 5S audit, to tracking the current state of implementation;
• Leading forward the employees through consistent 5S audits, with standard questions to continuously improve results.

In the aim of check the 5S method and to sustain the process performance, was used the 5S audit. Figure 2 shows the evolution of the 5S audit, started in week 11 until week 26, in company “A”.

As it can be seen in figure 2, by implementing and sustaining the specific actions and rules of 5S method is created a continuous improvement of the established targets. By continuous supporting of 5S method and checking the implemented process, it can measure the management performances of industrial processes.
4. Conclusions
The 5S study of this paper, describes the 5S (seiri, seiton, seiso, seiketsu, and shitsuke) method implemented to improve the workplaces, to increase the working environment quality, to eliminate or reduced mistakes, in order to sustain the industrial process performance. The advantages we can have by implementing the 5S method, are: development of a quality-conducive working environment, eliminate errors, mistakes and problems are visual, reduction of waste, reduction of waiting and searching time, transparency and clearness of workflow and workplaces, establish standards (everyone knows exactly where to find things), work safety and ergonomics of all employees.

After implementing the 5S method, have been achieved the following results (figure 3):
• Preparing workshops on 5S topics (agenda, participants, objectives, etc.);
• Moderating the 5S workshops;
• Drafting the 5S standard catalogue in 85% proportion and permanent update of its;
• Communicating the 5S standards catalogue;
• Supporting on training and implementation the new 5S standards;
• Supporting production workers in compliance standards;
• Supporting the development personal service on 5S topics;
• Drafting the standardization form of process work and the 5S audit form;
• Training for 5S audit and process confirmation;
• Achievement the process confirmation of workplaces and the 5S audit;
• Supporting the process confirmation achievement;
• Establishing the reporting mode of 5S activities;
• Performing and continuous improvement of the 5S method implementation.

The 5S audit structure implies: responsible (production area manager and the foreman), participants (workers, production preparation responsible and the lean expert), fervency of doing (monthly by the foreman and quarterly by the production area manager), how long will take (30 minutes analyze and discussion of deviations and results), how to report (by an action plan and daily checking the implementation of established measures). The process confirmation main objective is to observe the work process and to identify the weaknesses. Responsible to doing the process confirmation is the shop leader whit support of the lean expert and the production preparation responsible. Process confirmation fervency is three workplaces per week, with a long between 20-30 minutes each workplace and he process confirmation results are reported each week in a meeting by establish the action plan, if are deviation from standards. The tools used in checking the process work has the advantage to allow the permanent checking of maintain and respect the standards, offer improvements who give a higher level of safety, order and efficiency to the workplaces, and give a permanent feedback and follow discipline in the process work. Implementing the 5S lean method gives the advantage of waste reducing, reducing the time access to the materials and needed tools, cleaning and orderly workplace, safety increase at the working place, productivity increase, improving discipline, stress reducing, and quick detection of problems.

Figure 3. Phases of implementing the 5S method.
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