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ANALYSIS OF 5S METHOD AND ITS APPLICATION IN MANUFACTURING

Annotation. The mantra of the 5S method is «A place for everything, and everything in its place». Why it is important or suggested to implement this method in manufacturing? Many organizations have chosen to follow 5S workplace organizational and housekeeping methodology as part of lean manufacturing processes or continuous improvement. 5S is a system to reduce waste and optimize productivity through maintaining an orderly workplace and using visual cues to achieve more consistent operational results. Firstly, we will explain 5S steps – sort, set in order, shine, standardize, and sustain – that are also sometimes known as the 5 pillars of a visual workplace. Secondly, we need to understand why it is important and what problems it can solve. In addition, we will explain a 3-step process of 5S implementation, including Value stream mapping (VSM) as a vital part of this process. In the end, we would like to point out main benefits of following 5S method in the company. The result is an improved manufacturing process and the lowest overall cost for goods produced.

Keywords: 5S method; lean manufacturing; visual management; workplace; manufacturing process; 5S check-sheet; VSM.

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АНАЛІЗ МЕТОДУ 5S ТА ЙОГО ЗАСТОСУВАННЯ НА ВИРОБНИЦТВІ

Анотація. «Місце для всього і все на своєму місці» є мантрою методу 5S. Чому важливо і бажано впровадити цей метод у виробництві? Багато організацій вирішили слідувати методології «5S» по організації робочих місць та ведення господарства в рамках постійного вдосконалення або в процесі бережливого виробництва. 5S являє собою систему, метою якої є скорочення кількості відходів і підвищення продуктивності праці за рахунок підтримки впорядкованого робочого місця і за допомогою візуальних підказок для досягнення більш послідовних операційних результатів. Перш за все, ми пояснимо етапи методу 5S, такі як сортування, впорядкування, наведення ладу, стандартизація і підтримка існуючого стану, які також іноді називають 5 стовпів підтримки візуального робочого місця. По-друге, ми повинні зрозуміти, чому важливо дотримуватись даної методології і які проблеми це може вирішити. Крім того, ми пояснимо 3-ступінчастий процес впровадження 5S, включаючи створення карти потоку цінностей (VSM) як важливої частини цього процесу. Зрештою, ми хотіли б відзначити основні переваги застосування методу 5S на підприємстві. Результатом є поліпшення виробничого процесу і нижча собівартість вироблених продуктів.

Ключові слова: метод 5S; бережливе виробництво; візуальний менеджмент; робоче місце; процес виробництва; чек-лист 5S; VSM (планування потоку створення цінності).

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АНАЛИЗ МЕТОДА 5S И ЕГО ПРИМЕНЕНИЕ НА ПРОИЗВОДСТВЕ

Аннотация. «Место для всего и все на своем месте» является мантрой метода 5S. Почему важно и желательно внедрить этот метод в производстве? Многие организации решили следовать методологии «5S» по организации рабочих мест и ведения хозяйства в рамках постоянного совершенствования или в процессе бережливого производства. 5S представляет собой систему, целью которой является сокращение количества отходов и повышение производительности труда за счет поддержки упорядоченного рабочего места и с помощью визуальных подсказок для достижения более последовательных операционных результатов. Прежде всего, мы объясним этапы метода 5S, такие как сортировка, упорядочение, наведения порядка, стандартизация и поддержка существующего состояния, которые также иногда называют 5 столпов поддержки визуального рабочего места. Во-вторых, мы должны понять, почему важно придерживаться данной методологии и какие проблемы это может решить. Кроме того, мы объясним 3-ступенчатый процесс внедрения 5S, включая создание карты потока ценностей (VSM) как важной части этого процесса. В конце концов, мы хотели бы отметить основные преимущества применения метода 5S на предприятии. Результатом является улучшение производственного процесса и ниже себестоимость производимых продуктов.

Ключевые слова: метод 5S; бережливое производство; визуальный менеджмент; рабочее место; процесс производства; чек-лист 5S; VSM (планирование потока создания ценности).

Problem and the relevance of the study. The evaluation of workplace capability and visual management standards within organization is one of the methods to define its business approach. Nowadays every organization strives to improve quality, eliminate waste, and increase profits by creating value based on customer needs. To reach those goals companies use Lean Manufacturing tools, one of these is 5S method [3]. Thus, the question how one organization can achieve efficiency gains through implementing 5S is still relevant and requires further research.

Analysis of recent research and publications. Substratum of 5S methodology belongs to Taylor [10] for his work on «scientific management» and Frank Gilbreth's «time and motion studies» [2]. Later, many scientists and researchers have done research on 5S, such as R.Schonberger [9], Hirano [3], Chris Ortiz [8] and other. All together viewed 5S as an element of a broader construct known as visual control, visual workplace, or visual factory.

Purposes of the article. The goal of this article is to evaluate 5S method as a simple tool for organizing workplace in a clean, efficient and safe manner to enhance organization's productivity, visual management and to ensure the introduction of standardized working.

Core material. 5S is a methodical way to organize your workplace and your working practices as well as being an overall philosophy and way of working. Method consists of 5 phases, each named after a different Japanese term beginning with the letter “S”: seiri, seiton, seiso, seiketsu, and shitsuke (Figure 1).

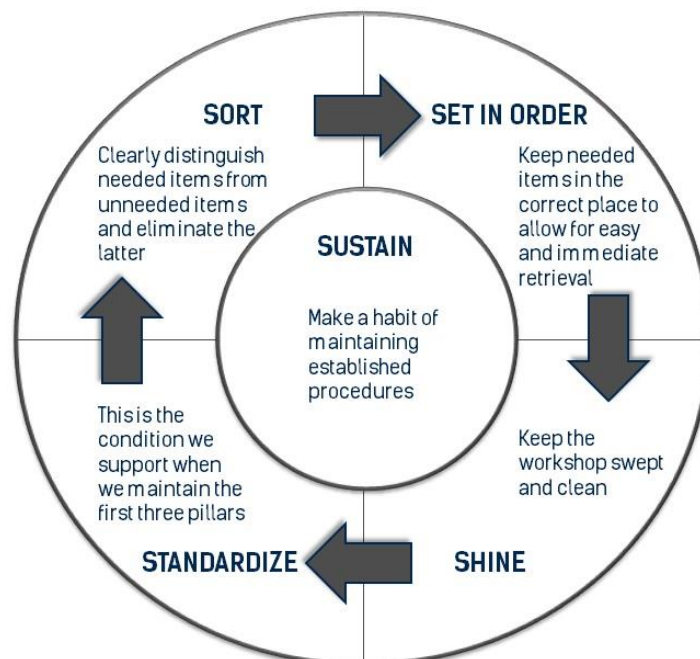


Figure 1. 5S plan [7]

5S as a methodology has come out of the techniques within Total Productive Maintenance (TPM) and from the Toyota Production System (TPS). However many of the individual components such as creating ergonomic and efficient work places belong

to Gilbreth. He showed that by improving the ergonomics of a bricklayer working methods he could reduce the number of individual movements required and increase the hourly output from 120 to 350 bricks laid each hour [2]. The idea of this method is to concentrate on maintaining the standards and discipline to manage the organization, especially on workplaces, called gemba [6].

Continuous improvement is another aim of every company, which can be reached by day-to-day workplace organization, meaning using 5S. It is equally applicable and successful in all areas of economics, helping to achieve high impact results. This particular lean tool allows workers to organize their workplace in the safest and most efficient manner, which also includes the discipline to check and repair equipment. Workers use audit documents that are completed from time to time by responsible workers within the gemba to manage entire process [1]. Further, we will explain the components of 5S.

Seiri is the first step in 5S, which refers to the sorting of the clutter from the other items within the work area that are actually needed. At this stage the team should remove the parts that do not belong to this working area and keep the ones that should be involved in the process when needed. Second stage is Seiton or Straighten, the process of taking the required items that are remaining after the removal of clutter and arranging them in an efficient manner through the use of ergonomic principles and ensuring that every item «has a place and that everything is in its place». Next is Seiso or Sweep, which is the thorough cleaning of the area, machines, tools and other equipment to ensure that everything looks neat and as new. This will ensure that any non-conformity stands out, such as an oil leak from a machine onto a bright, newly painted clean floor. Fourth step is Seiketsu or Standardize, the process of ensuring that what we have done within the first three stages of 5S become standardized. Workers should have common standards and ways of working to ensure that every action is done in the most efficient, time-saving and safest way. Standard work is one of the most important principles of Lean manufacturing. The final stage is Shitsuke or Sustain, ensuring that the company continue to improve in workplaces organization using the previous stages of 5S, maintain housekeeping, and conduct audits and so forth. 5S

should become part of the culture and the responsibility of everyone in the organization [6].

One of the main benefits of a typical 5S implementation is significant reductions in the square footage of space needed to perform operations. Likewise, method helps to organize tools and materials into labeled and color-coded storage locations, as well as kits of instruments just needed to perform a task. Accordingly, work can be done faster and without any obstacles. That is why 5S is essentially a support to other lean tools as JIT production, TQM, 6 sigma method, and cellular manufacturing etc.

Table 1 (below) provides a brief explanation of each 5S pillar with its meaning, importance in the production, and problems it can avoid.

Table 1

The 5 pillars of a visual workplace [3]

Pillar	What does it mean?	Why is it important?	What problems are avoided?
Sort	Remove all items not needed for current production operations. Leave only the bare essentials: when in doubt, throw it out.	Space, time, money, energy, and other resources can be managed and used most effectively. Reduces problems and annoyances in the work flow. Improves communication between workers. Increases product quality. Enhances productivity.	The factory becomes increasingly crowded and hard to work in. Storage of unneeded items gets in the way of communication. Time wasted searching for parts/tools. Unneeded inventory and machinery are costly to maintain. Excess stock hides production problems. Unneeded items and equipment make it harder to improve the process flow
Set in order	Arrange needed items so that they are easy to use. Label items so that	Eliminates many kinds of waste, including: Searching waste. Waste due to difficulty	Motion waste. Searching waste. Waste of human energy. Waste of excess inventory.

	anyone can find them or put them away.	in using items. Waste due to difficulty in returning items.	Waste of defective products. Waste of unsafe conditions.
Shine	Keep everything, every day, swept and clean.	Turn the workplace into a clean, bright place where everyone will enjoy working. Keep things in a condition so it is ready to be used when needed.	Lack of sunlight can lead to poor morale and inefficient work. Defects are less obvious. Puddles of oil and water cause slipping and injuries. Machines that do not receive sufficient maintenance tend to break down and cause defects.
Standardize	Integrates Sort, Set in Order, and Shine into a unified whole.	By ensuring conditions do not deteriorate to former state, facilitates implementation of the first three pillars.	Conditions go back to their old undesirable levels. Work areas are dirty and cluttered. Tool storage sites become disorganized and time wasted searching for tools. Clutter starts to accumulate over time. Backsliding occurs.
Sustain	Making a habit of properly maintaining correct procedures. Instill discipline necessary to avoid backsliding.	Consequences of not keeping to the course of action greater than consequences of keeping to it.	Unneeded items begin piling up. Tools and jigs do not get returned to their designated places. No matter how dirty equipment becomes, nothing is done to clean it. Items are left in a hazardous orientation. Dark, dirty, disorganized workplace results in lower morale.

Implementing 5S method, organizations use checklists to ensure effective implementation of method requirements [7]. First of all, checklists help to organize the workflow, outlining what must be done, and when those tasks must be carried out. This provides a clear workflow and list of duties for all involved employees. Secondly,

necessary steps are outlined. A 5S checklist helps employees determine the specific, actionable tasks that must be performed to accomplish the larger goal. Next, it keeps employees informed. Employees can review a 5S checklist to see what has been accomplished, who is working on particular duties, and where they can assist. Also, checklists help to create thorough processes. They should include all relevant tasks, no matter how mundane or repetitive, so that employees do not skip easily-forgotten or oft-overlooked duties. In addition, workers can easily focus on important work. When employees do not have to wonder whether they forgot something or overlooked a key part of the process, they are freer to work on high-level duties and important tasks that contribute to larger goals.

5S checksheets should be maintained on daily basis. An example of a checksheet is illustrated in Table 2.

Table 2

An example of 5S Check Sheet [7]

Machine Number:			Mon	Tue	Wed	Thu	Fri
Machine Name:			3/11	3/12	3/13	3/14	3/15
Machine Locaton:							
No.	Checks	Frequency	Initials of Person Responsible				
1	Red tagging contaminated items	Daily					
2	Remove residue from valves	Daily					
3	Check oil level	Every Tuesday					
4	Apply grease to transfer side	Every Thursday					
Check	Supervised by Bill Smith	Daily					

5S method is now being applied to a broad variety of industries except manufacturing, such as education, health care and government. Moreover, it can also be applied to knowledge economy work, with software, information, or media instead of physical product.

However, some companies have been reluctant in the past to follow Japanese initiatives for business improvement (5S is considered to be one of many tools of

Japanese lean production system), so some consultancies have come up with non-Japanese equivalents. For instance, 5S is also known as 5C: Clearing, Configure, Clean and Check, Conformity, Custom and practice. CANDO is another alternative: Cleanup, Arrange, Neatness, Discipline, and Ongoing Improvement [5].

Summary. 5S method is one of many other Lean Manufacturing tools, but one of few widely implemented. Factories and other organizations should review their operation`s methods in order to improve safety of workers, performance in productivity, quality and morale which leads to increased profitability, and to reduce waste. Employees gain a sense of ownership, involvement and responsibility. Furthermore, 5S method forms a solid base for continuous improvement, as indicated in 5th element – «sustain». Maintenance of working place is important for both workers and company as a whole. Henceforth, other benefits of 5S method should be evaluated, such as providing safety, visual perception of gemba, and motivation of employees to work more efficiently.

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