



INCORPORATION OF 5S METHODOLOGY IN CONSTRUCTION PRACTICES

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ABSTRACT

The purpose of this paper is to explore the principle of 5S methodology for identification of waste in construction organisation. Efficient material management is essential in managing a productive and cost effective site. In this working career, the author has been observing inefficient labour productivity practices, resulting from poor site material management, and handling. In this paper, therefore an attempt has been made to rectify these activities in construction organization. Primary objective of the study is to improve the labour productivity on residential building sites, which needs to bring down substantially by devising suitable method. A case study follows that demonstrates, how 5S methodology can ameliorate the productivity.

Key words: Lean construction, Material management, Labour productivity.

INTRODUCTION

5S system is a method used for setting up and keeping quality of working environment in an organization. This methodology can manage space, human effort, time, quality and capital to make the end product with less faults and make the site a well ordered, disciplined and clean place to work. 5S is a system to decrease wastage and optimize quality and productivity through monitoring an organized environment and obtain more firm results.

The 5S are as follows :

- Set in order (Seiton)
- Sort (Seiri)
- Shine (Seiso)
- Standardize (Seiketsu)
- Sustain (Shitsuke)

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The initial stage in 5S is put the things where they provide the best support for the work. The second stage is deciding what is essential in the work environment and what is not. The third stage is inspection, repairing and cleaning things to find and remove the root causes of waste and dirt. The fourth stage is team working and the members must have consensus on normal and new way of work. The fifth stage is personal discipline to follow the standards and to continue the above 4S' throughout the lifetime of the project.

EXPERIMENTAL

Research methodology

Objective

To implement the 5S method in Construction industry to study its effects in productivity and project duration. To maintain well organized, clean, high effective and high quality workplace. Improve work's tidy environment. Elimination of losses. Improvement of the quality of work.

Implementation

A site is chosen and the labour productivity is studied. A brief break is taken to study about the problems for low productivity and the methodology of 5S is finalized. After the thinking of about how to implement the 5S, the project is watched keenly and some changes are inflicted. Through sorting it can be identified which materials, tools and equipments are most wanted and least wanted. Regular cleaning is permitted to identify and to eliminate sources of disorder and to maintain clean workplace. Worked out and implemented standards in the form of procedures and instructions permit to keep the order on the workplaces. Standards should be very communicative, clear and easy to understand. 2 Male Coolies are hired and the work is assigned to them. The labours are insisted to do over time of 2 hrs after every regular working hours. They are scheduled to get ready for the next day's work and cleaning the area of site in which the work has been done that day.

Project details

This project deals with the 5S methodology in construction practices. The project is carried out in mannivakkam (near vandalur) under the banner name Adinath foundations. The total duration of the project is two and a half years. SMIPL has quoted the contract work for 75% of the project. My project is done for 22 working days under the supervision of Mr. R. Ramesh, (Project Manager) and Mr. L. Satyanarayanan (Site Supervisor). The overall cost of the project is 57 crores.

Data collection

Accumulation of data

Data collection is the process of gathering and measuring information on targeted variables in an established systematic fashion, which then enables one to answer relevant questions and evaluate outcomes. The main goal for all data recording processes is to capture quality evidence that then translates to rich data analysis and allows the building of a convincing and credible answer to questions that have been posed. Likewise data recording has been done for 11 working days in a site for plastering and block works, which are the main components of a construction site. Data collected from 22.10.2015 to 6.11.2015 has been furnished as a whole in a tabular format. This is collected without implementing the 5S technique to show how the importance of productivity has gone unnoticed for several days. These values are taken in the first floor of a 4 storey building. The total number of masons are also shown to calculate the productivity of one mason for a day. This data is collected during a conventional method of practice.

Table 1: Data collected before implementing 5S

S. No.	Productivity recorded from 22.10.2015 to 6.11.2015	Value in m ²	No. of masons for the whole work
1	Internal wall plastering	479.75	65
2	External wall plastering	451.87	58
3	Ceiling plastering	385.41	46
4	8" Block work	950.73	72

Table 2: Data collected after implementing 5S

S. No.	Productivity recorded from 05.01.2016 to 19.01.2016	Value in m ²	No. of masons for the whole work
1	Internal wall plastering	472.92	46
2	External wall plastering	489.87	48
3	Ceiling plastering	475.32	46
4	8" Block work	1083.64	70

This data is collected after implementing 5S method keeping in mind the area of work, floor of work constant before and after implementing 5S. The lead time is decreased by minimising the wastage of time for transporting materials. After collecting this data, the productivity difference is negligible but the labour cost is very high in conventional method.

Factors affecting productivity

- Improper arrangement of materials
- Retention of unwanted materials
- Untidy workplace
- Time wastage by labours

To overcome the productivity and the factors affecting productivity some of the regulations imposed are –

- Hired two helpers other than the existing labours
- Proper arrangement of required materials based on the ongoing work
- Workplace maintained legibly
- Fed knowledge to the workers
- The principles introduced are made mandatory

Site details

Site name	Adinath Shanti Niketan
Site location	Mannivakkam
Client	Adinath foundations
Contractor	SMIPL
Total area of site	31,392 m ²
No. of towers	8 nos
No. of flats	530 flats in total
Build up area of each tower	2340 m ²
No. of storeys	4 Storeys

RESULTS AND DISCUSSION

Individual analyses of five organizations successfully showed that 5S implementation has an effective impact on performance of organization. In addition investigating the impact of 5S on performance factors such as productivity and labour cost revealed that implementation of 5S is an effective way to improve and promote the organizational performance level. The comparison of all the plastering and blockwork productivity before and after implementing 5S is graphically represented below. The difference in labour cost is also shown so as to ensure that 5S methodology has a drastic impact on the productivity and cost of the project. Differences in time can also be shown for further development of the method in construction practices.

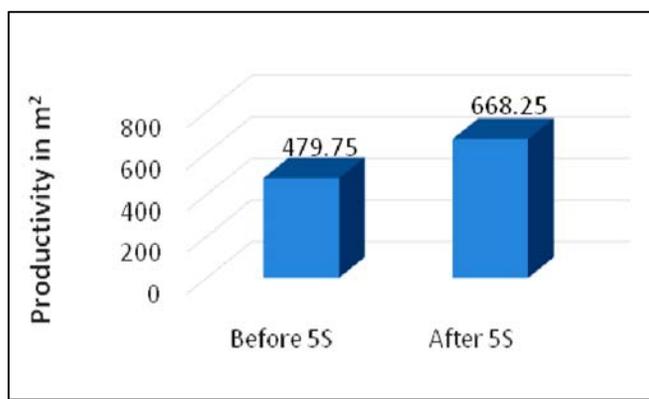


Fig. 1: Productivity difference in internal plastering for 65 masons before and after implementing 5S

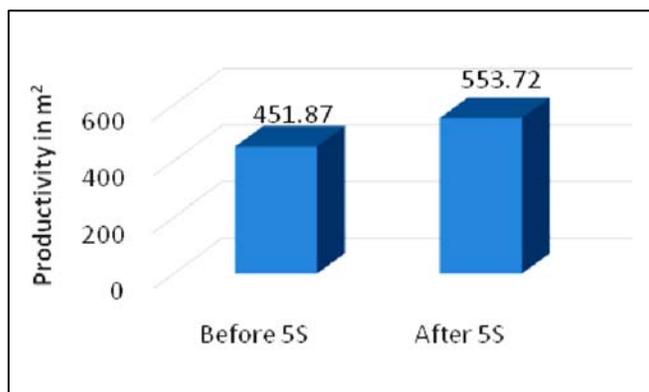


Fig. 2: Productivity difference in external plastering for 58 masons before and after implementing 5S

In Fig. 1, the difference in productivity in internal plastering is found to be 188.5 m². Therefore the productivity difference for 1 mason in 1 day is 17.13 m². In Fig. 2, the difference in productivity in external plastering is found to be 101.85 m². Therefore, the productivity difference for 1 mason in 1 day is 9.25 m².

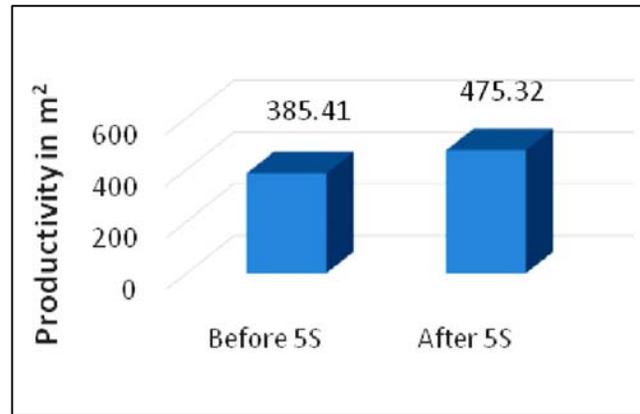


Fig. 3: Productivity difference in ceiling plastering for 46 masons before and after implementing 5S

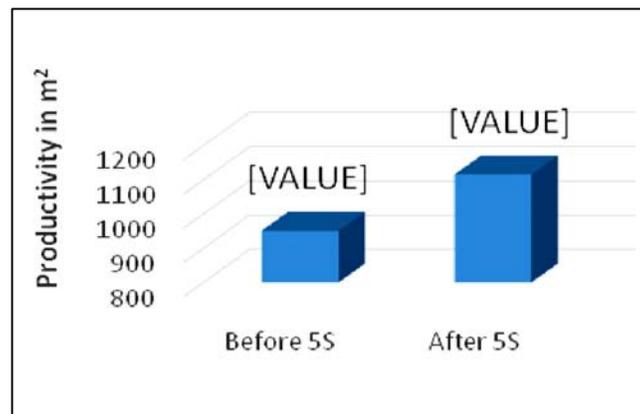


Fig. 4: Productivity difference in 8 inch blockwork for 72 masons before and after implementing 5S

In Fig. 3, the difference in productivity in internal plastering is found to be 89.91 m². Therefore the productivity difference for 1 mason in 1 day is 8.17 m². In Fig. 4, the difference in productivity in internal plastering is found to be 163.88 m². Therefore the productivity difference for 1 mason in 1 day is 14.89 m².

The productivity after implementing 5S has shown drastic improvement in one day's time for one mason. Therefore it can be substantially very useful as a long term process. Each and every S has to be followed correctly so as to ensure a major productivity difference. Following are the analysis of cost difference before and after implementing 5S.

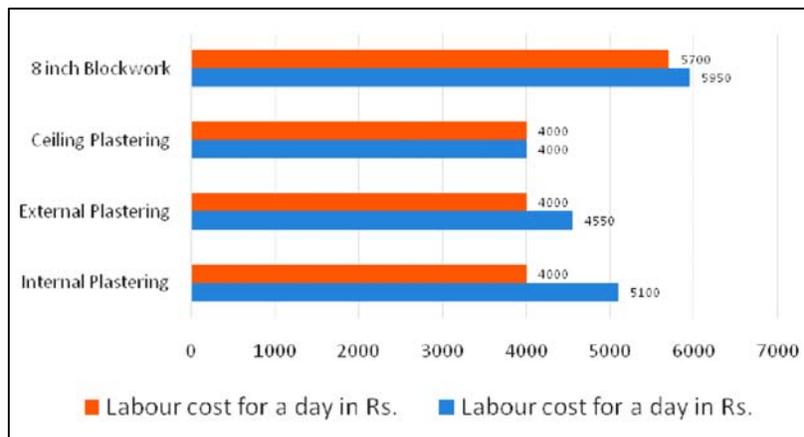


Fig. 5: Labour cost comparison for each activity before and after 5S

From the above tables and graphs, we can infer that after implementing 5S, there is a rigorous improvement in productivity rate and even labour cost. One day can bring up to Rs. 1000-1500 difference in labour cost that too for just 4 activities. The overall duration of the project is around 800 days and there are many activities. Therefore, 5S can be a major success in the construction field taking into account the overall duration and all the activities including the micro activities.

CONCLUSION

The successful implementation of 5S requires that everyone understand why it is being used and what the expected results are, as the removal of familiar (although unneeded) items and the reorganization of processes can be extremely unsettling. This may need to be coupled with training in the principles of 5S. Simply implementing SORT can have rapid results that demonstrate a company's commitment to change, whilst the application of the other elements can dramatically improve productivity and reduce both waste and lead time. The use of SORT and SHINE are excellent methods for involving people very early on in the change process. Often they find the experience to be exciting and fun and in this way it can be used to create a pool of people who are both positive and motivated about change.

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