

## **EFFECTIVE PROJECT MANGEMENT THROUGH IMPLEMENTATION OF LEAN MANUFACTURING TECHNIQUES IN PROJECT PLANNING**

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### **ABSTRACT**

Project plan is the basic guideline followed in executing any project and its planning is most instrumental in successful implementation of a Project. Present day projects are facing huge challenges of resource constrains which can be managed through effective Project planning and implementation of concepts of Lean Manufacturing. Lean construction is the buzz word of today's Project Management. To make the construction lean we need to apply Lean Manufacturing Techniques like 5 S , Kaizen , TQM , Triz etc at the Project planning level. Also customization of the Project plan and Schedule based on local input is also a key parameter is successful implementation of any Project. The concepts of implementing 5 S in Project planning and schedule verification also will require a customization check to ensure what we are planning is practically possible which is done through customization check and ascertaining the customization Index for the schedule prepared. Modern day Project management requires innovation at all levels and latest technology implementation to get it implemented in least time and cost.

**KEYWORD: Lean Manufacturing , Project planning , Customization Index, Five S.**

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### **I. INTRODUCTION - Project Management and Modern day Challenges :**

Project Planning is one of the key functions of Project Management for timely and successful implementation of any project. The time frame available for any industrial project to be executed is very less and to make the matter more difficult the statutory clearance & approvals from government often take longer than expected thus further reducing the available time. For example a typical petrochemical plant, from its conceptual stage to start-up , is as little as three years. Engineering , Procurement and construction functions are to be carried out in most efficient manner to meet the demand for completing the project within the overall time span. There are two basic phases in project management ; the Planning phase and the Controlling phase. Better Planning will make a strong base for effective Control of a project.

In today's project execution Optimization is the key and emphasis is more of how you execute a project. The resource constrains and increasing cost of capital has forced stakeholders to go for Lean Construction. Earlier for Capital projects, machinery , manpower and other resources were never an issue but now everything is scarce and valuable. So to optimize the execution process

operation philosophy has been very effective in present day like Lean Manufacturing, JIT or 5 S. Lean construction is a answer to the ever increasing desire to execute projects in most efficient ways and so it derives all necessary help from the existing Lean Manufacturing techniques like Kanban , 5 S, Kaizen , QC, JIT , TQM , quick setup/changeover, Poka Yoke, Visual Control and Five Whys. We are all aware that to face challenges of Manufacturing sector, Lean manufacturing was adopted where in, the main aim was to improve the efficiency of the process through total involvement , Statistical tools , Systematic problem solving, innovative thinking. While lean construction is identical to Lean Production in spirit, it is different in how it was conceived as well how it is practiced. But it is firmly believed that virtues gained through Lean manufacturing can be implemented in Project Planning and execution field to achieve higher efficiency and better competitiveness.

## II. What is 5 S ? :

5 S is a Japanese concepts initially applied in Toyota in 1960's which can be also termed workplace management. But the 5 S concept when reviewed was found very effective for Project Planning also. The five S signifies five steps Seiri, Seiton , Seiso, Siketsu, Shitsuke.

<b>SEIRI</b>	----	Sorting out necessary and unnecessary (including Surplus, even if necessary) items and removing the unnecessary from workplace
<b>SEITON</b>	----	Logically fixing location of each necessary item And keeping the item at that place only. Place for Everything & Everything in its Place.
<b>SEISO</b>	----	Thorough scientific and periodical cleaning of each and every item with inspection.
<b>SEIKETSU</b>	----	Systemizing and standardizing the practices for above 3 steps so that they become easier to follow by every one.
<b>SHITSUKE</b>	----	Discipline to follow above steps repeatedly so that FIVE S becomes a habit, a way of life.

At the first look it appears that these above has got no relevance in project planning but after proper analysis it is found that the above steps are a must to prepare a realistic ,effective and efficient schedule.

## III. 5 S for effective Project Planning:

Now Step wise let us interpret the significant of 5 S in Project Planning and Schedule preparation :-

**SEIRI** ---- **Sorting out necessary and unnecessary.**

This is the Step 1 in which we evaluate our schedule to identify that is there any event or job that is not required and thus can be removed. Say for example Soil testing for civil design. If we

already have a soil test data of that area which is representative of the place then we can remove that activity from our planning. So from the list we can remove some jobs or activities which are redundant and so is purely a wastage. It will ultimately help in crashing the time and cost of the project. Another example is the activity of transporting a fabricated item to site. This activity along with required resources can be saved if we get the fabrication done at site. So these kind of optimization and crashing is possible if we pass the project schedule / Plan through 1 S- Seiri Litmus test.

**SEITON ---- Place for Everything & Everything in its Place.**

The schedule in Project planning is putting every activity in right sequence. The actual execution procedure must be envisaged and based on that we need to identify whether jobs can be done in parallel or after one another. The schedule is based on various relationship between activities like start to finish, start to start, finish to start and finish to finish. So at this stage we conduct 2- S SEITON test on our schedule to identify that our entire list of jobs/activity in the schedule is in right sequence or we can prepone / postpone any activity. This will ensure our resource allocation and planning in most effective and efficient way. The net result of this 2 S test is to realign our activities based on resource availability, working sequence, space management, approach availability and overall procurement plan with EAS (Expected at Site).

**SEISO ---- Thorough scientific and periodical cleaning of each and every item with inspection.**

The schedule or Project plan needs to be reviewed time to time with the progress of work and committed dates coming in. It transfers the schedule from assumption based to schedule based on committed dates. The effect of local environment and catch up plan also are incorporated in the project plan.

**SEIKETSU ---- Systemizing and standardizing the practices for above 3 steps so that they become easier to follow by everyone.**

The monitoring of project execution is to be done on regular basis to judge the project progress. The mathematical model to review the project progress like S curve, milestone plan etc is to be calculated on regular basis. The reports and monitoring procedure is to be standardized and information flow is to be standardized so that all stakeholders are aware of the progress. Project review meeting and schedule compliance report ensures that the above 3 S steps are followed strictly. Also any diversion or deviation from the planned path needs to be highlighted and all stakeholders to be informed.

**SHITSUKE ---- Discipline to follow above steps repeatedly so that FIVE S becomes a habit, a way of life.**

Preparation of a robust plan considering every aspect of project execution, reviewing the plan time to time based on actual inputs and then taking all necessary steps to achieve the schedule is the basic path that has to be followed with full discipline. Adhering to the plan and reviewing the plan on regular basis is to be made the habit.

#### IV. Application of 5S for Schedule optimization:

From the above **Five S steps** we can take Project Management to a different level of effectiveness. The above study was then applied in a project plan to find out its practical effectiveness. A cross country pipeline of 30 kms length supplying water to an industrial complex was identified to study the above concept. The initial schedule was collected and the above procedure was applied.

On application in 1 S SEIRI Test following optimization was possible

- A) Cathodic Protection which was earlier considered was removed as it was not required.
- B) The activity of wrapping coating of pipe was removed through procurement of pre coated pipes.
- C) Horizontal Direction Drilling to cross Ash Canal removed and open cut crossing proposed which will reduce both time and cost.
- D) Separate transmission line for feeding Power was dropped as the existing line of DPL can be used.

The above activities were removed from the schedule after 1 S Test which helped significantly in reducing time and cost for the cross country pipeline project. All wastage were identified from the schedule and removed to make it more efficient.

Through 2 S SEITON Step the following improvements were achieved :

- A) Identified monsoon months and ensured that during that time we don't plan our pipe pushing activity.
- B) Plan the pipe laying activity in shallow water bodies in the summer months when water dries up.
- C) Divide the route into various segments and plan the execution based on necessary consent or approvals received.
- D) Flushing and Fill test in different segment immediately after completion of that portion and not wait for the complete line to get complete.

The above exercise ensured that the schedule is arranged as per local condition and achieve maximum realignment for effective Project Planning. The basic concept used is Every activity has a right time and sequence to get executed and put every activity in right sequence and time.

The 3 S SEISO Step is basically reviewing the Project plan and schedule on a regular basis ( i.e weekly to fortnightly ) to understand the variance and project progress. Based on the real time inputs from Procurement, Engineering and Construction, modifying the schedule or Plan to make it relevant. 3 S Seiso step comprises the essence of 1 S and 2 S. With the implementation of 3 S we ensure that the project schedule and plan remains dynamic and captures the actual picture of the project.

The 4 S SEIKETSU Step is the review of the systems in place to monitor the progress , report the progress and all others means used to control the project. The Project review meeting frequency , involvement of stakeholders in review meeting , reporting procedures and agenda review are all analyzed to make it very effective and thus ensuring a continuous comparison between Plan and Actual.

The 5 S SHITSUKE step is ascertain that the above review and monitoring procedures and being done on a regular basis and adhering to the schedule or Plan has become an habit as has deeply impregnated in the work style of the Project manager and his team.

On Implementation of the 3,4,5 S's in the project planning of the Cross Country pipeline it was found that the project monitoring and reporting system got changed completely. It was decided that the format of reporting needs to be changed and be marked to only those peoples who are involved. Also a fortnightly joint review meeting and weekly site review meeting plan was formalized. Safety and Quality update in weekly Report was also included. These above and several others were taken based on 3,4,5 S steps which helped the Project management team to deliver better results with same resources.

#### **V. Locally customized global standard schedule :**

Another major challenge for effective planning is customization of the planning to local environment which includes climatic conditions , government regulations , social and cultural influence etc. A project planning for Eastern part of India will be completely difference from a project located in western India. Importance of Planning increases many fold primarily because there is a constrain in resources required. For technical planning related to design of a Plant this customization is well recognized and never compromised but for schedule planning we normally neglect the importance of customization. To ensure that the Project Planning is customized we prefer to conduct **Customization test** which will ensure that the schedule is based on actual site condition thus reducing uncertainly in project execution.

#### **VI. What is Customization Test and Customization Index ?**

The concept of customization test is similar to Hazop study procedures where we validate our Schedule based on certain attributes which is a good measure to gauge the suitability to local effect and conditions. Hazop study procedure ensure safety at the design stage the Project planning customization test ensures that the planning is based on actual site condition and the threshold score is achieved. If the threshold score is not achieved then we have to again modify our project plan to suit the local conditions.

Engineering :

1. Soil data
2. Weather and rainfall data.
3. Wind flow.
4. Seismic data.
5. Social considerations ( Minimum manpower or labour intensive ).
6. Statutory obligations.
7. Government participation and support.
8. Infrastructure available.
9. Power and water availability.
10. Land availability.
11. Construction philosophy.
12. Similar Industry benchmarking.

All the above and many more considerations are to be taken care to make the engineering tailor made for the local area where the project is getting implemented.

#### **Procurement**

1. Local Vendor availability study.
2. Mode of Transport.
3. Site fabrication/activity or fully fabricated pre constructed package delivery.

4. Capital backup of local vendors.
5. Storage system required after delivery at site.
6. Revenue and financial rules and obligations.

### Construction

1. Construction philosophy adopted.
2. Climate condition and monsoons.
3. Construction resource sourcing from local area.
4. Local manpower availability and characteristics.
5. Statutory compliance for labour and site construction.

Based on the above parameters the Project plan is verified and concluded whether the minimum customization required has been achieved or we need to revise our plan for successful execution of the project. A model has been set forth to determine the Customization Index of the Project. The Threshold Customization Index ensure that Project plan is outlined considering all local effects and can be followed to successfully execute the project.

### VII. CONCLUSION :

On application of 5 S steps and Customization Index in Project Management it was observed that the Cost , Resources and Time were reduced significantly. The overall probability of Project execution as per schedule improved many folds once the above concepts were implemented in the project Plan. The Lean Manufacturing Techniques being time tested and well established in delivering financial competitiveness to the overall Project Management. In today's project there is a trend of using the schedule to justify project delays and so project schedule follows actual progress rather than Project progress following the planned schedule. This trend is mainly due to various undetected slack put into the schedule and absence of proper benchmarking. The present paper tries to resolve this limitation by removing all undetected excess slack/redundant jobs and identifying proper benchmark schedule which can be followed for successful project execution. The dynamic nature of the environment is adequately addressed through the above steps and the project management becomes flexible, efficient and effective.

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