OPTIMIZATION OF PRODUCTION COST IN CONSTRUCTION PROJECT

[1]Shoaib Subhan Mulla, [2]Ketan Ushir,

[1]M.Tech, Research Scholar in construction Engineering, Sandip University, nashik,
[2]Assistant professor, Sandip University, nashik.

Abstract: Cost optimisation should be done during construction to keep costs manageable. Construction is about time and money. Construction costs more and takes longer. The study optimises production costs for Eagle Infra India Ltd. in Maharashtra, India. The study will collect data from April 2018 until present. This study will rely heavily on field observations, in-depth interviews, focus group discussions, and questionnaires. The data was analysed by project, design, owner, consultant, contractor, materials, labour, equipment, and outside influences. The study's findings focused on construction cost optimisation and reducing time and expense overruns. Careful planning and control, a good monitoring and tracking system, a safe and organised work environment, daily work progress recording, time-cost trade-offs, a plan-do-check-act quality policy, trained workers, and careful supervision are the best ways to reduce construction costs. The study suggests lean construction strategies (VSM, 5'S and Pareto analysis) for constructability and cost optimisation.

Keywords: Optimization, Construction, EIIL, Production cost, Cost minimization, Lean Construction Methodology.

1. Introduction

Construction management is a prime example of the discipline of keeping expenditures under control, projects on schedule, and making the most use of resources. Unit pricing, lump sum payments, and cost plus pricing are the three pricing models that are frequently used in building contracts. Any construction project must carefully consider its budget (Akalya, 2018). You should also consider how long it will take to complete the project. The construction process has had some significant obstacles. The primary factor in determining a building's total cost is the cost of the materials. The Critical Path Method (CPM) and the Program Evaluation and Review Technique are examples of conventional project management techniques (Bindu, 2015).

To keep construction costs low and within the budget, "cost optimization" should be carried out at various stages of the building process. In the construction industry, time savings can lead to benefits like receiving a bonus for finishing a project earlier than expected or lowering administrative expenses. Therefore, it is strongly encouraged to maximise both time and money. It is not always ideal to choose the option with the lowest price (Lyubov, 2017).

1.1. Objectives

1. To identify the value added and non-value added activity in Casting cycle and their effect on cost and time using value stream mapping.
2. To provide proper storage area management and site infra setup by identifying the waste using 5's as lean construction tool.
3. To observe the problems after Deshuttering and determine the frequency of occurrence using Pareto analysis.
4. To enhance the productivity and efficiency of the construction project using lean construction technique.

2. Literature review

kumar, et al., (2015), According to his research studies, proper planning, and selection procurement of material, installation, operation, and maintenance and equipment replacement policy plays important role in construction management. Ramkrishna, et al., (2021), According to his analysis there is no proper execution and tracking of a work. Improper management of time, cost and manpower are the major factors that contributes to poor inventory control. Senthil, et al., (2017), According to his research the PERT/ CPM technique can bring a great contribution to the optimization of the cost and time of project of the horizontal laminator production process. It can lead to reduce the costs and even increase the amount of projects. Gunduz, et al., (2019), He examines to minimize the construction cost and duration at each phase is important. Mainly affecting the factors on cost of project is delay in project and materials. Ramkrishnan, et al., (2017), in his analysis when the bulk of the cost is decided in early stage of design, it is recommended to focus on cost in concept design stage itself. Strategic cost reduction aligned with development process and product strategies can reap huge benefits on cost.

3. Methodology

To reduce waste and production costs, the three approach tools (VSM, 5S, and Pareto analysis) were used. Using value stream mapping, I will identify the value-added and non-value-added activities in the casting cycle and their impact on cost and time in this chapter of research analysis (Senthil, 2017). By employing the 5S method as a lean construction tool to identify waste, you can also provide proper storage area management and site infrastructure setup. I will watch the issues after deshuttering and use Pareto analysis to gauge their frequency of occurrence. Will employ lean construction approaches to increase project production, profitability, and efficiency.

4. Result and discussion

After value stream mapping, 5's, and Pareto analysis were implemented, the graph illustrates the reduction in waste % in the relevant structure of casting production. Defects are reduced from 50% to 22.5 %; waiting is decreased from 100% to 0%; transportation is decreased from 87.5% to 22.5 %; inventory excess is decreased from 50% to 0%; motion waste is decreased from 37.5% to 0%; excess processing is decreased from 25% to 0%; and overproduction is decreased from 25% to 0%.

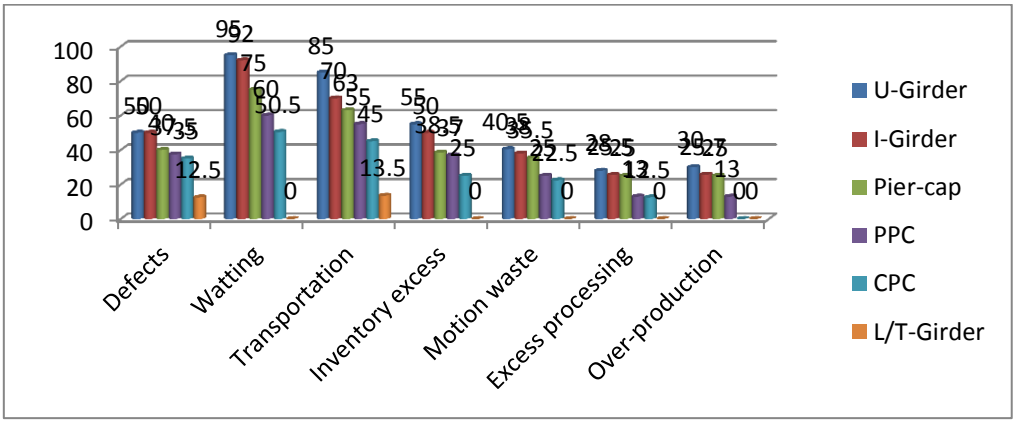

Figure.1. Graph of overall waste reduction in % (Source: Self Drawing)

4.1. Production cost and overall production time

Table.1. Description of production cost and time (Source: Survey Data)

S. No.	Casting Structures	List of trails	Production cost (Rs)	Production time (Days)
1.	U-GIRDER	Trail – I	1605547	20
		Trail – II	1505030	15
2.	I-GIRDER	Trail – I	564730	13
		Trail – II	515025	10
3.	PIERCAP	Trail – I	473650	11
		Trail – II	413029	7
4.	PPC	Trail – I	1647890	12
		Trail – II	1545084	9
5.	CPC	Trail – I	1477533	6
		Trail – II	1416030	3
6.	L/T-GIRDER	Trail – I	392615	5
		Trail – II	352010	3

4.2. Production cost analysis

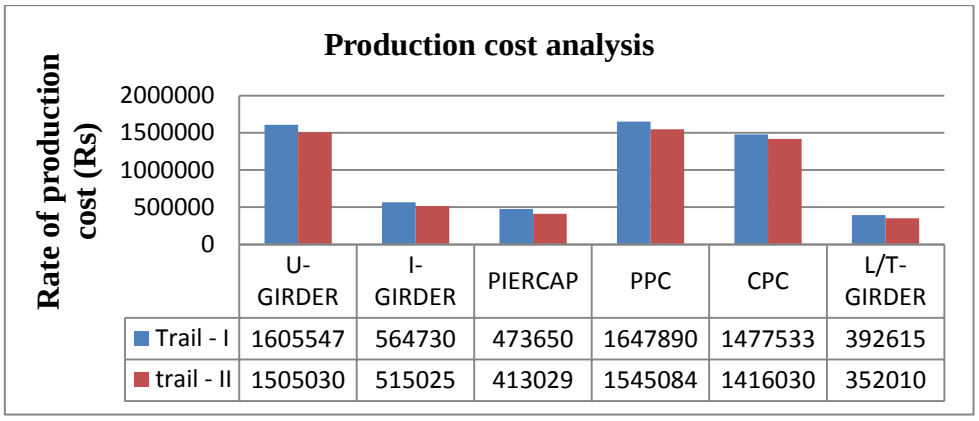

Figure.2. Graph of total production cost of structure casting (Source: Self Drawing)

Interpretation

According to the inferences drawn from the preceding graph, the decrease in production cost of structural casting is found to be Rs 1,00,517 (after moving from the structure with the highest production cost to the structure with the lowest production cost).

Total cost reduction = (Production cost of U-GIRDER Trail – I) – (Production cost of U-GIRDER Trail – II)

Total cost reduction (Rs) = 1605547 – 1505030

Total cost reduction (Rs) = 1,00,517

4.3. Production time analysis

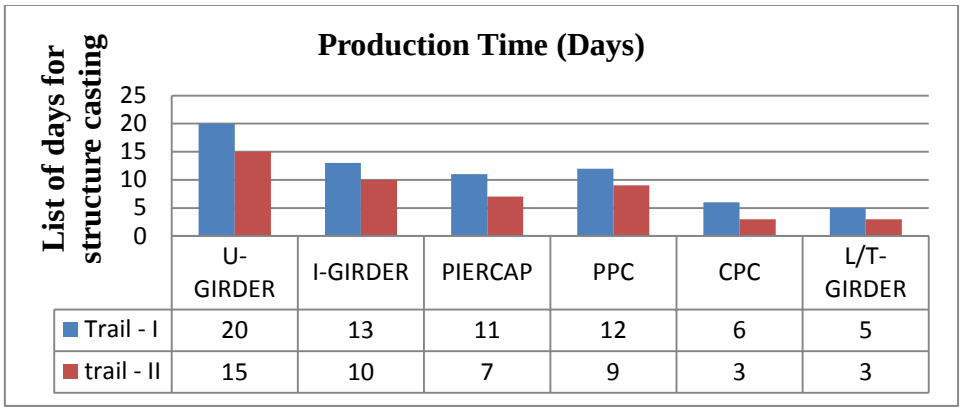

Figure.3. Illustration of graph for time analysis (Source: Self Drawing)

Interpretation

According to the inferences drawn from the graphs presented above, the reduction in production time for structural casting is found to be 5 days (after following the structures' greatest production time to their lowest production time).

Total time reduction = (Production time of U-GIRDER Trail – I) – (Production time of U-GIRDER Trail – II)

Total time reduction = 20 days – 15 days

Total time reduction = 5 days

4.4. Overall time and cost reduction

The purpose of the production cost and time reduction process is to raise a firm's profitability while also cutting operating costs. Depending on the products or services a firm provides, its strategies may alter.

Table.2. Calculation of reduction in production cost and time (Source: Survey data)

S. No.	Casting Structures	Reduction in production cost (Rs)	Reduction in production time (Days)
1.	U-GIRDER	1,00,517	5
2.	I-GIRDER	49,705	3
3.	PIERCAP	60,621	4
4.	PPC	1,02,806	3
5.	CPC	61,503	3
6.	L/T-GIRDER	40,605	2

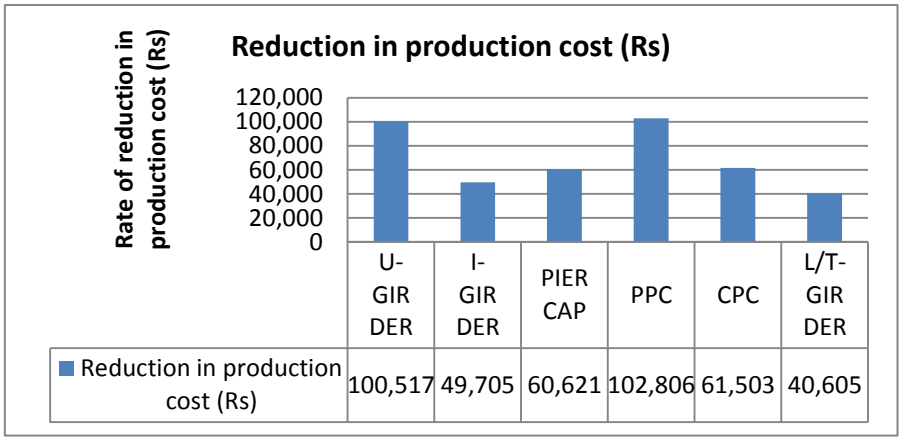

Figure.4. Illustration of reduction in production cost (Source: Self Drawing)

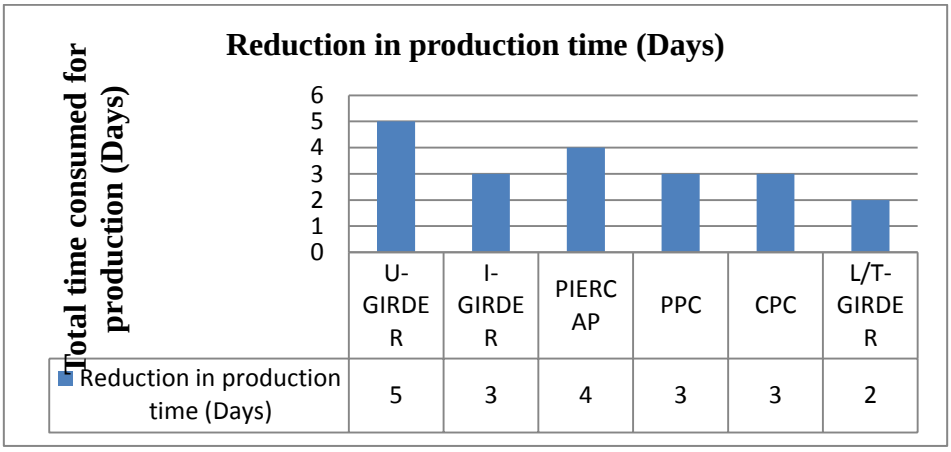

Figure.5. Graph of reduction in production time (Source: Self Drawing)

The use of VSM, the 5'S, and Pareto Analysis, in addition to a reduction in both time and cost, were all contributing factors. We come to understand that Reduction in the manufacturing cost of structural casting and in the amount of time required for casting, as determined by our study, the outcome of our overall work is as follows:

1. Reduction of production cost Rs 1,00,517/-
2. reduction of production time (in days) = 5 days
3. reduction of material cost Rs 35,000/-

As a result of doing extensive study and analysis, I came to the conclusion that "with production cost, production time, and materials cost are gradually reduced with the stage of progress (production of structure casting), along with Steel procurement cost also reduced."

5. Conclusion

This study needed lean building strategies to succeed. Lean improves the structural casting cycle. Value stream mapping reduces project completion delays. The variational structured method and five-sigma methodology work well for process optimisation. VSM removed all procedural waste. Pareto analysis is the best way to identify the biggest project delays and costs. Risk checklists, Excel spreadsheets, constraint analysis, task breakdown structures, social subcontracts, action research, and others can help identify and solve learning phase variance. VSM efficiency improves.

Eagle Infra India Ltd; management must support VSM since it reduces autonomy by giving process participants decision-making power. This study expands our understanding of VSM, 5S, Pareto analysis, causes and hurdles to complete implementation, and lean construction's well-known benefits. Literature evaluations show efforts to better organise and acquire projects and change the unconnected design and construction culture. Lean production has affected the industrial sector more than the structural industry.

References

Akalya. K, Rex L. K, and Kamalnataraj. D. 2018. Minimizing the Cost of Construction Materials through Optimization Techniques. *IOSR Journal of Engineering (IOSRJEN)*, ISSN (e): 2250-3021, ISSN (p): 2278-8719, PP 29-33, www.iosrjen.org.

Anuja Rajguru, and Parag Mahatme., 2015. Effective Techniques in Cost Optimization Of Construction Project. *International Journal of Research in Engineering and Technology* Vol. 4, pp. 464-469.

Edgar P. Small, Khaled Al Hamouri, and Husameddin Al Hamouri, 2017. Examination of Opportunities for Integration of Lean Principles in Construction in Dubai. science direct online available 196(2017), *Elsevier Publication*, pg (616-621).

Fadeyi, M.O. 2017. The role of building information modelling (BIM) in delivering sustainable building. *Value International Journal of Sustainable Built Environment*, 6, 711-722.

Gedde Teja Pavan Kumar Reddy and B. Harish Naik. 2016. Enhancing Cost Efficiency in Construction Using Earned Value Management. *International Journal of Civil Engineering and Technology (IJCIET),* 7(6), pp.357–363.

Iqbal Shakeri, Khashayar Asadi Boroujeni, and Homan Hassani. 2015. Lean Construction: From Theory to Practice. *International journal of academic research*, Vol. 7. No.1. January, 2015, pg(129-136).

Murat Gunduz and Ayman Naser. 2019. Value Stream Mapping as a Lean Tool for Construction Projects. *International Journal of Structural and Civil Engineering Research,* Issue: February 2019, Volume 8(1), pg 69-78.

Ramkrishna K. Kokare, and G. N. Kanade. 2021. Implementation of Lean Construction Techniques to Minimize Cost and Time of Project. *International Research Journal of Engineering and Technology (IRJET),* e-ISSN: 2395-0056, p-ISSN: 2395-0072, Volume: 08 Issue: 03 | Mar 2021 www.irjet.net.

T. G. K. Vasista, 2017. Strategic cost management for construction project success: A systematic study. *Civil Engineering and Urban Planning: An International Journal (CiVEJ)* Vol.4, No.1, March 2017.