

IDENTIFYING FACTORS TO REDUCE WASTES IN QUARRY INDUSTRY OF SOUTH GUJARAT

¹Abhay P. Bhuva, ²Bhavin K. Kashiyani

¹Student of M.E.Civil (Construction Engineering and Management), ²Assistant Professor Civil Engineering Department

¹Civil Engineering Department,

¹S.N.Patel Institute of Technology, Umrah, Surat, India.

²Civil Engineering Department,

²S.N.Patel Institute of Technology, Umrah, Surat, India

Abstract— Construction industry suffer the time and cost overrun in which one of the reason behind it is resource management. Quarry industry is one of the base industry. The end products of quarry industry are used to each kind of construction work. Lean philosophy was develop to reduce and eliminate wastes from the production industry. This paper is concentrated to identify the factors behind the wastes in the quarry industry of south Gujarat mainly Chikhali and Areth area. The main wastes are unnecessary movement and waiting for the work and buffer in the operations.

Index Terms— Buffer in operation. Construction, Lean philosophy, Quarry industry.

I. INTRODUCTION

The construction industry all over world consume thousands of tons of natural and artificial material in which material out come from quarry is common in all kind of construction projects. Aggregate produced by a quarry is most common for the different work like road work, concrete work and other product which used for different construction works and themes. A quarry contains a set of over-all main processes which are the same at all quarries even though the machines used depend on the availability, production capacity needed at the specific site and the aimed substance. Due to the characteristics of work in these processes there should be an optimization potential in real-time control of the overall process in optimizing each task towards the overall production throughput using manufacturing production optimization principles such as Lean.

Lean production is a manufacturing improvement philosophy and technique developed by Toyota. Lean can be described as a method and approach for continuous improvements of a production process. Lean is used to increase quality, just in time and decrease production costs. A typical project approach to Lean is to analyses improvements in a specific process to achieve a certain output metric. Lean defines a set of principles, tools and methods. The main objective behind this research work is to identify crucial factor affecting the quarry industry of south Gujarat region mainly Chikhali and Areth.

II. NEED OF STUDY

India's rapid economy growth over the past few decades has placed a tremendous stress on its limited infrastructure. Quarry industry is one of the base industry which provide the raw material in most of construction work. Identifying wastes in the quarry industry help to reduce the cost of raw material improve the supply chain which lead to reduce chances of cost and time overrun due to resource problem.

III. LITERATURE REVIEW

Existing data and literature on the lean principle and its application in production industries around the world was collected. This formed the reference for preparing questionnaire for collecting data and ground situation of the industry.

According to Chick G. ET, "waste is more than the physical waste that are the focus of construction site activity". [Devaki M. P] waste in any activity that does not add value in product or service.

Activates can be,

Essential non value adding:

These activates does not add value to product but essential to complete value adding activates. Example: Detail plan is not customer pay for it but used to execution of right work in right place.

Waste:

Waste in the work itself is waiting for information, poor quality, waiting for information, waiting for material etc. in short waste can be define as prevented work activity from being carried out or execution.

According to Hines and Rich, "these non-value adding activates are pure waste and should be eliminated completely" [Devaki M. P]

According to Koskela and Howell, Lean construction is a way to design to minimize waste of materials, time and effort in order to generate the maximum possible amount of value [Devaki M. P]

Waste in the continuous production industry can be classified according to lean principle as below listed, [Khalil, R. A]

Defects/rework: Scrap and fixing errors

Transport: unnecessary material movement

Motion: unnecessary and awkward movement

Waiting: delay for an upstream activity to complete

Inventory: excessive work in process inventory

Over production: making more just in case

Over processing: beyond what customer wants

Unused human capital: lost innovation opportunities

IV. METHODOLOGY

The Main source of data which required for the work were collected from the literatures as well as personal interview with some experts of industry and questionnaire survey on the quarry of Chikhali and Areth region of south Gujarat. The flow of work is as shown below sequence.

1. Review existing literature.
2. Preparation of questionnaire.
3. Questionnaire survey.
4. Analysis of data.
5. Conclusion.

The questionnaire survey was conducted at the quarry of Chikhali and Areth area. 100 quarry were visited for the questionnaire survey. The questionnaire were filled at the site by consulting with responsible person and interview with them to get the additional comments.

The data collected from the questionnaire survey are gather in the data sheet and calculated relative importance index (RII) -to get to factors affecting the industry and include non-value adding activities.

$$RI = \frac{\sum W}{A * N}$$

Where, w = weight given by each respondent between

A= highest weight of index. i.e. 5 in our case

N= number of respondent

Weight ‘W’ belong to (1 to 5), where, ‘1’ indicate very low and “5” indicate very high effect on the industry.

V. RESULT AND DISCUSSIONS

The main factors which lead behind the wastes are as listed below which are ranked by the Relative Importance Index (RII) by the feedback of questionnaire filled by respondents are as below,

NO.	Factors	Rank
1	Material quality	0.78
2	Government Polices	0.76
3	Local public influence	0.75
4	Unnecessary movement	0.74
5	Buffer between steps	0.71
6	Waiting for Work	0.63
7	Defect in moving equipment	0.62
8	Environmental Problems	0.61
9	Weathering effect	0.55
10	Under Production	0.5

Table 1. Ranking of Factor

The questionnaire contain 9 main different criteria which are production, Time and Delay, Site conditions, Transpiration, Processing, Inventory, Movements, Defects, Influences. In which total 38 questions were there, under the main criteria.

Result of the survey are as shown in the table 1 as well as in the graphical form as shown in chart 1.

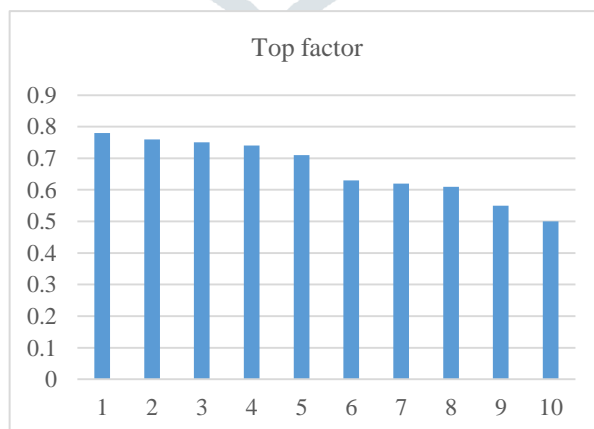


Fig .1 Top factor identified from Data

Material quality is one of the top factor identify in the survey which van be maintain by maintaining the quality of crusher and shaker. As the all business men, Government policies are the important factor. Local public influences are quite high in the industry. The main reason behind the influence is that they do not have other place to rehabilitation.

Due to uncertain demand and supply and demand of different end product and quantity of output of end product differ, thus available stock have to be transfer to another place which need place to store inventory as well as huge investment in it.

Buffer between steps required due to different site conditions and waiting for work in different location also make delay in work and convert in the waste and loss in production.

Defects in the moving equipment does not predictable but the frequency of defects can be reduce by maintaining the equipment with proper care and service which is quite leggy in the real situation.

The result of the above factor and other influences like weathering effects, environmental problems etc. will lead to delay in production, which ultimately tends to be under production of the overall industry.

VI. SUMMARY AND CONCLUSION

The quarry industry is one of the base of construction industry which provide the raw material to construction industry but still lagging in the adopting new technology and changes.

Under production is a factor which cannot completely overtake but production can be improve by implementing lean principle in the industry which can be future scope for researcher.

It is impossible to transfer the quarry from the existing site because can't shift the mines from the place.

Unnecessary movement and buffer between steps as well as waiting for delay can be reduce and eliminate by the value stream mapping of the industry and analyses the data by the mapping which is future scope.

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