

An investigation of JIT(Just-In-Time) approach in inventory control of construction industry

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Abstract:

This report presents an overview of the Just-in-Time (JIT) in construction management system and discusses application and implementation issues for the control of material inventory in building construction. Implementation of JIT building material management in construction has the potential to realize the same far reaching benefits experienced in Construction. In this situation, the most useful technique is “just-in-time” construction that provides a significant improvement of project cost and time management. The fundamental principle of this technique is to achieve project time limitations without any unnecessary schedule improvement. During the course of construction, it is necessary to provide constant project control to monitor progress and add resources only when it is required to meet a project service date. Hence, this research report mainly focuses on applicability, significance and barriers to adopt JIT technique in construction projects based on rigorous literature survey Just in time philosophy has lot of Potential for managing movement of construction material from manufacturing yard to construction site. The traditional approach to material delivery has been used in construction industry for many years. It is imbedded in the corporate structure as the way to procure materials. Just-in-time production system is one of these initiatives that focus on cost reduction by eliminating non-value-added activities. This Report Deals with Implementing Just in Time Inventory Control Approach on Construction. JIT has Tremendous Effect on Material Delivery Operation. During Implementation of JIT Organization is required, to put desired efforts on all levels of the work. In this project proposed system is compare with conventional approach of building through Case study

Index term – Inventory management, Just in Time

I.INTRODUCTION

A)GENEARL

History of JIT Concept :

Just-in-Time (JIT) technique is one of the Japanese production strategy that improves the productivity by reducing the in process inventory. JIT means that in a flow process, the right parts needed in assembly reach the assembly line at the time they are needed and the amount needed The JIT approach started to be developed at Toyota by Taiichi Ohno, its vice president of manufacturing, and several of his colleagues since 1940s. At that time it was called the Toyota Production System (TPS). Just-In-Time was widely applied in Japan during the 1970's in the automotive and electronics industries. JIT may be described as an extension of the original concept of managing the material flow in industries to reduce the inventory levels at each stage. It is a demand driven approach, which encourages flow type production. It is also described as a drive to simplify the manufacturing system in order to quickly detects the problems and force immediate solutions.[4] JIT principle was introduced by Toyota Company in Japan. JIT is a system that produces the required item at the and in the quantities needed. By using JIT principle, we can maintain quality of the entire project and increases efficiency of the workers. JIT principle says that inventories are not more important and should be considered as waste.[4] Productivity is defined as the the amount of output(volume) that is obtain by each labour workforce or in simple word the total hours required to complete the task by number of labour. For achieving the better productivity the main task to study the actual cost of the labour and there is fluctuation in labour cost that affecting on level of the productivity .In every project there is cost,time and quality are main concern .If the performance of labour is improved automatically the productivity is get improved .The organization should be take care for the labour productivity by improving the work skills&conducting training ,motivational factors, better quality equipment, material and working conditions.

B) Definitions: Reviews of JIT Philosophy:

Just in Time (JIT) production is a manufacturing philosophy which increases speed of production. JIT Concept is, “Company produces only what is needed, when it is needed and in the quantity that is needed”. The company produces only what the customer requests, to actual orders, not to forecast. JIT can also be defined as producing the necessary units, with the required quality, in the necessary quantities, at the last safe moment. It means that company can manage with their own resources and allocate them very easily.[1] Materials management is an important function in order to improve productivity in construction projects. Bell and Stukhart (1986) defined materials management functions which include planning and material take off, vendor evaluation and selection, purchasing, expenditure, shipping, material receiving, warehousing and inventory, and material distribution. The result of improper handling and managing materials on site during a construction process will influence the total project cost,time and the quality [7]

Today construction industry needs to minimize cost in addition to improve quality and on-time delivery. According to lean manufacturing, “inventory” is important factor of any construction firm that increases cost, reduces profitability and requires more working capital without adding any value to the customer and organization. Unfortunately, in our traditional accounting system, inventory plays role as an “asset” whereas it is a most expensive “liability”. This fact was discovered by Toyota Motor Corporation and they developed a unique “Just-In-Time” technique to reduce inventory to the minimum possible degree. Just-in-time (JIT) is a stock control strategy used to increase efficiency and decrease waste thereby lowering inventory prices.[3]

JIT usually identifies seven prominent types of waste to be eliminated:

- 1.Waste from Overuse
- 2.Transportation Waste

- 3.Waste of waiting time
- 4.Inventory Waste

C) OBJECTIVE

- 1.To understand the detail philosophy of JIT for Construction Industry in India.
- 2.To study the procedure of implementation of JIT (Just-In-Time).
- 3.To investigate the problems in implementation of JIT .
- 4.To provide suggestion to eliminate problems and enhance the procedure

III.DATA COLLECTION

Observations on site-

1.PLANNING OF MATERIAL:

The most commonly used basis for planning things out for the project is the BOQ prepared by the client. Companies may have two major levels in planning- micro and macro level. Time, cost, material and labour are the four major types of planning undertaken on sites. The planning should be revised as frequently as possible in order to monitor whether work is progressing as planned.

2.PURCHASING OF MATERIAL:

Step 1 – Material Indent

Step 2 – Enquiry to Vendors

Step 3 – Vendor Comparison

Step 4 – Vendor Selection and Negotiations

Step5 – Purchase Order

Step 6 – Vendor Evaluation

3.RECEIVING OF MATERIAL:

1. Receipt from outside suppliers

2. Receipts from internal divisions.

4.INSPECTION OF MATERIAL

Inspection can happen in two ways

1. Pre- dispatch inspection

2. Inspection on site

5.ISSUING OF MATERIAL:

1. Issues to consuming departments

2. Issues to outside suppliers for processing or conversion

6. INVENTORY CONTROL:

Inventory defined as the quantity of goods or material on hand thus inventory control is the method of maintaining of stock at a level at which purchasing and stocking costs are at the lowest possible without interference with the supply

IV. DATA ANALYSIS:

RESULTS AND ANALYSIS:

Comparative analysis of conventional approach and JIT approach

While performing analysis for conventional approach actual ordering cost is evaluated and inventory carrying cost is assumed to be 18% for all materials with reference of examination during practical execution procedure of construction.

Inventory carrying cost is incurred for inventory maintenance, storage cost, insurance taxes, deterioration & obsolescence.

FLOOR	MATERIAL COST	INVENTORY COST	TOTAL COST
Ground Floor	2504172	450750	2954923
First Floor	2159481	388706	2548187
Second Floor	2109974	379796	2489770
Third Floor	2078514	374132	2452646
Fourth Floor	2078514	374133	2452647
TOTAL COST			12998173/-

JIT approach:**Inventory carrying cost:**

Content	Cost as % of inventory value	Conventional approach	JIT approach
1]Housing cost: Building rent or depreciation Building operating cost Taxes on building Insurance	(2%-10%)	3%	2%
2]Material handling costs: Equipment, lease, or depreciation Equipment operating cost	(1%-4%)	1%	1%
3]Manpower cost from extra handling and supervision	(3%-5%)	3%	2%
4]Investment cost: Borrowing costs Taxes on inventory Insurance on inventory	(6%-24%)	6%	5%
5]Pilferage, scrap, and obsolescence	(2%-10%)	6%	1%
Overall carrying cost	(15%-50%)	18%	14%

1]Reduce inventory cost:

While considering analysis for JIT (Just-In-Time) approach material ordering cost is evaluated and inventory carrying cost is assumed to be 14% for all materials with reference of examination during JIT execution procedure of construction. Inventory carrying cost is incurred for inventory maintenance, storage cost, insurance taxes, deterioration & obsolescence

FLOOR	MATERIAL COST	INVENTORY COST	TOTAL COST
Ground Floor	2504172	350585	2854757
First Floor	2159481	302328	2461809
Second Floor	2109974	295397	24053771
Third Floor	2078135	290938	2369073
Fourth Floor	2078514	290991	23669505
		TOTAL COST	12460515

Therefore ,if inventory carrying cost is 14% then ,total cost reduced by 4%,since JIT inventory method saves 4% cost construction project.

2) Safety stock:

Introduction: When a product is introduced in the market, the error in the forecasted demand will be high . The error can be either positive or negative depending on customer response and hence a moderate level of safety stock is required.

FLOOR	MATERIAL COST	FROM SAFTY STOCK FACTOR	TOTAL COST
Ground Floor	2504172	1	2504172
First Floor	2159481	1	2159481
Second Floor	2109974	1	2109974
Third Floor	2078135	0.5	1039068
Fourth Floor	2078514	0.5	1039257
	TOTAL COST		8851952/-

When new material procurement to be scheduled then consider material cost from safety factor i.e. material quantity consider half of actual.

Therefore, total cost reduces by the 29,52,747/- and this amount will used for current activity required material.

1) Application of JIT on column casting activity of third floor :

By using conventional approach,

Target: 20 column casting

Duration: 9 days

MATERIAL	FOR 1 COLUMN	FOR 20COLUMN	RATE/-	COST
STEEL	36.5 Kg	730Kg	45/Kg	32850
CEMENT	2.25 Bag	45Bag	285/-	12825
SAND	0.1 Brass	2Brass	7000/-	14000
AGGREGATE	0.12 Brass	2.4Brass	2300/-	5520
TOTAL COST				65195/-

By application of JIT concept,

At this floor for column casting aluminum formwork are used instead of plywood formwork which are conventionally used in this area.

MATERIAL	FOR 20COLUMN	TAKE MATERIAL FROM STOCK	NEW PROCUREMENT	COST
STEEL	730Kg	100Kg	630Kg	28350
CEMENT	45Bag	15Bag	30Bag	8550
SAND	2Brass	1Brass	1Brass	7000
AGGREGATE	2.4Brass	1Brass	1.4Brass	3220
TOTAL COST				47120/-

Cost of formwork consider 6000/-additional

Therefore, $47120+6000=53120/-$

By conventional method cost is 65195/-which reduces by18075/- and total duration reduces by 2 days.

Problems in Just-In-Time Practices :

Despite the fact that JIT as theoretical idea appears to be wonderful, there are some obstructions in getting this idea work in all actuality and get JIT implemented appropriately. Some of the barriers that may arrive while adopting the JIT technique are listed below:

1. The JIT framework must work effectively and worker must carry out their activity right.
2. JIT depends on participation and trusts between individuals, specialists, supervisors, providers, clients and so on.
3. The idea of JIT must be seen completely in a similar importance by all concerned and after that endeavor usage.
4. Implementing JIT is frequently extremely costly, when the preparation, and to give training to workers i.e. To prepare skilled labours .
5. Problems with site access that include blockage, congestion within the site, no room for parking the long vehicle
6. Incorrect type of material delivered
7. Poor communication, Receiving, handling and storage of unused materials

Recommendation:

1. There should be a centralised material management team co-ordination between the site and the organization.
2. Proper control, tracking and monitoring of the system is required.
3. Awareness and accountability should be created within the organization
4. By implementing the JIT we can eliminate the waste and also reduces inventory problem.
5. On observing that the in order time required for transfer of material from one place to another place is more so we can suggest to use inside material stock to reduce the time
6. The performance factor of activity is very less to affect efficiency so reduces non value added activity so the efficiency is increases
7. JIT implementation improves competitive performance by lowering inventory levels and reducing quality costs and non-value added activities.

Conclusion:

The purpose of this study is to make sure the application of concept Just In Time (JIT) at construction industry. The results that analyse from before and after the application of JIT:

Raw material always in enough quantities.

Work in process always at the minimum quantity

Finished good would directly deliver to buyers.

Buffer stocks always at the minimum quantity.

Delivering raw material depends on demand only.

Space for inventories is small.
Time table scheduling is made by the suppliers.
Delivering materials is more often and only at small size.

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