Analysis and Development of Procured Concrete Utilizing CLP Model

Hemant Singh Parihara,*, MohitVermaa

Hemant Singh Parihara,* MohitVermaa

A Department of Civil Engineering,GLA University, Mathura Email*: hemantsingh.parihar@gla.ac.in

ABSTRACT

The proficient planning of materials procurement & storage on construction sites might lead to important developments in project profitability &construction productivity. The current surveys concentrate on storage layout &material procurement as 2 discrete planning tasks without deliberating their mutual & difficult interdependencies. The current work reports the improvement of novel optimization method for construction logistics design, which will be able of concurrently optimizing & integrating the difficult planning decisions of material storage & procurement on construction sites. The method uses EOQ to diminish construction logistics prices, which cover stock-out, material ordering, financing, and prices of layout. The method includes newly established procedures to assessment influence of probable material shortages on-site due to late delivery on stock-out costs &project delays.

Keywords: construction logistic cost, storage area planning, price breaks, planned shortages. 1.

Introduction

The material storage & procurement on construction sites require be suitably planning and performing to evade negative influences of material shortage. The deficiencies in supply and stream of construction substance are frequently mentioned as main reasons of economic losses & productivity degradation. Ordering minoramounts of material very commonly reduces locked-up capital in material inventories nevertheless, it enhances possibility of project delays & material shortages. On other side, ordering big amounts of material rarely reduces the possibility of “material shortage and project delays”; nevertheless, it increments the price of locked-up capital in large inventory buffers on-site. The construction planners require deliberating this difficult trade off throughout the planning of storage on- site & material procurement.

Numerous surveys are conducted to examine the storage &procurement of construction material on-site. Hence the construction logistic planning (CLP) model is adopted because which has interdependencies among the procurement decisions & storage areas. The details of the construction logistic cost are explained below:

1.1 Purchase Cost

This denotes to nominal price of inventory. It will be purchase cost for items, which have bought from externalsources& production price, whether items have generated within organization. This might be persistent per unit or it might be varying as quantity purchased decreases or increases.

1.2 Ordering Cost

Ordering cost will be incurred when the inventory will be replenished. It incorporates price associated with chasing &processing of purchase order, transportation inspection for quality expediting overdue orders & etc. It will be also identified as the price of procurement.

1.3 Carrying Cost

It also identified as storage or holding price, carrying price signifies the price, which will be associated with storing an item in inventory. It’s proportional to number of inventory& time over that it will be held. The carrying price elements include the opportunity price of capital invested in stock; the prices directly connected with storing goods; obsolescence cost; deterioration costs & costs incurred in preventing deterioration and fire and general insurance, etc.

1.4 Stock –out Cost

Stock out cost means the price associated with not helping the consumers. The stock outs imply shortages. If stock out will be internal it would imply, which few production will be lost resulting in idle time for machines &men, or that work will be delayed that may attract some penalty.

Objective

The objectives of this research work will be to introduce the improvement of “construction logistics planning (CLP)” method, which is proficient of optimizing &integrating difficult planning decisions of “material procurement & material storage on construction site”.

Methodology

The methodology adopted in this study is illustrated in Figure 1.

i. Construction logistics planning method is used to minimize the construction logistic cost.
ii. Different optimizing application like resource utilization, time-cost trade off, and site layout planning gevolves towards the better solution.

Procurement decisions like fixed order procurement and just in time procurement.

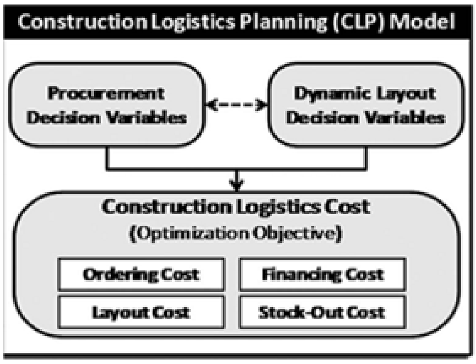


Figure1. **Methodology adopted**

EOQ Model

The classical economic order quantity model also recognized as "Wilson formulation", which the very fundamental of all inventory methods. This method is analytical one. For this, first a cost method is developed and then it will be manipulated to create an inventory method. The classical EOQ model is shown in Figure 2.and Figure 3.

Q= amount of pieces toorder

D= annual demand in units for inventory item

A= ordering cost of every order

EOQ= Q* = optimal number of pieces toorder

h= holding price per unit per year

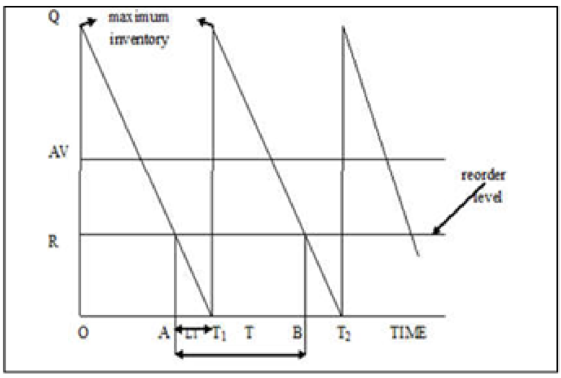


Figure 2: **Inventory Model**

$$\text{Total inventory cost} = A * \frac{D}{Q} + h * \frac{Q}{2}$$

$$EOQ = Q^* = \sqrt{\frac{2DA}{h}}$$

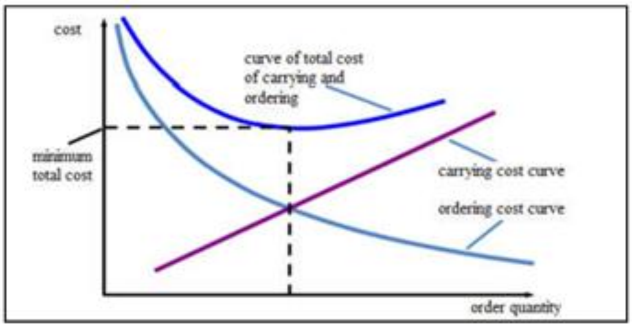


Figure 3: **Classical EOQ Model**

Determination of Reorder Level

i. Once the order quantity will be defined, the subsequent decision will be when to order.
ii. The time among placing an order & its receipt will be named as lead time (L).
iii. Inventory should be accessible during this time to meet demand.
iv. When order will be usually expressed as reorder point – the "inventory level" at that order must belocated.

ROP = (demand per day) (lead time for an ovel order in days).

The reorder point is shown in Figure 4.

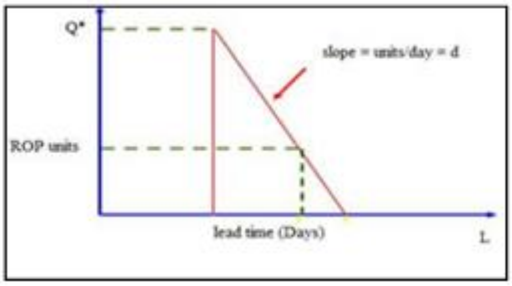


Figure 4: **Reorder point**

EOQ with Price Breaks

As mentioned earlier, the classical EOQ method will be rely on assumption that unit price of item under deliberation is uniform. In daily life, however, it will be not uncommon to discover price discounts, which have been rely on the quantity for that order will be placed. In general, whether orders are big sizes, then fewer prices might be quoted. There might be one or more than one price break that might be offered. Clearly, in cases like these, the quantity ordered has to be described carefully taking in to deliberation the cost levels for the diverse quantity ranges. When unit price is uniform, purchasing price is irrelevant in describing order size. However, under condition of price breaks, the item price, being a function of the order quantity will be incremental price &

should be incorporated in price method. As such, the price method would incorporate ordering the holding & purchasing price of item.

$T(Q) = A * D\ Q + h * Q\ 2 + CiD$ (3)

Where Ci = price breaks for the different demands of materials.

Inventory with Planned Shortages

In common inventory conditions, a shortage will be deliberated unwanted& if probable evaded. This is due to shortage might be to mean loss of consumer product will decrease in upcoming orders, uncomplimentary modification in share market& etc. Whereas in few conditions, the consumer might not withdraw orders & wait until subsequent shipment arrives. This latter condition will be named as stated previous the back ordering condition. We will now improve an inventory method under assumption that back ordering will be probable. The EOQ method accepts that inventory will be restocked exactly, whereas the “inventory level” drops to zero as represented in Figure 5. There will be no question of shortages and hence, the shortage price is not deliberated in that method. With assumptions of back ordering, shortages might be intentionally planned to happen. It might be advisable on economic consequent high holding price. Principally, then it will be query of setting off shortage price against saving in holding price.

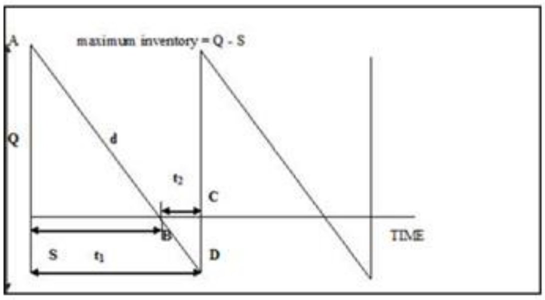


Figure 5 **Inventory with planned shortages**

ABC Analysis

In this examination, the inventory items in organization have categorized based on their utilization in monetary terms. It will be very usual to notice that little amount of items account for a huge share of whole price of material &comparatively bigamount of item include an irrelevant share. On the basis of this criterion, the items have separated into 3 classifications, they are A: high, B: moderate, and C: low consumption value items.

The item separated into numerous classifications will be proficient by plotting the utilization of item of attain “ABC distribution curve” that will be also named the pareto curve or the curve of mal-distribution. The mechanics of the ABC examination will is provided in step-wise method.

Step 1: attain a item list along with data on their periodic consumption& unit price

Step 2: describe the annual utilization value for every of items by multiplying unit price with amount of units & rating them in descendent sequence based on their corresponding utilization value.

Step 3: signify every item value as aggregate utilization value percentage. Now cumulate the percent of annual utilization value.

Step 4: obtaining every item percentage value. For n item will signify 100/n %. Therefore if there are 20 item included in classification, then every item would display 100/20=5% of materials.

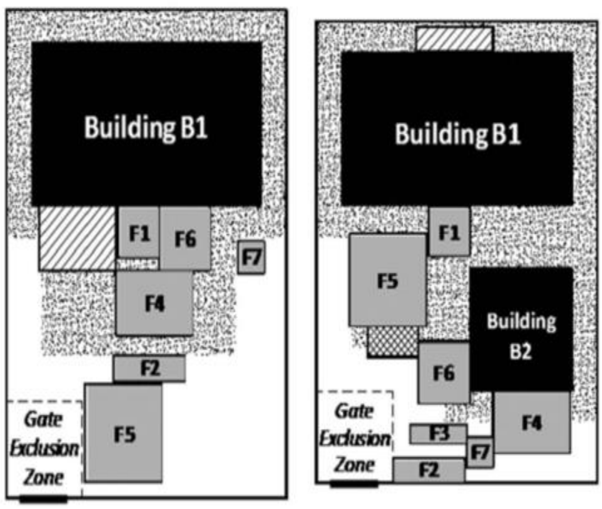
Step 5: utilizing data on cumulated percentage usage value &cumulated item values plot the curve by display these, correspondingly on X and Y axis.

Step 6: describe suitable divisions for A, B & C classifications. The curve world rise steeply up to a point. This point will be marked &item up to that point establishes the A–type item. Likewise, the curve is only being moderately sloped towards upright. The point beyond that slope will be insignificant is marked & item covered beyond that point will be classified as C–type item due to they cause only an in significant increment in price. The other items are B-type items for that curve represents a slow upward rise.

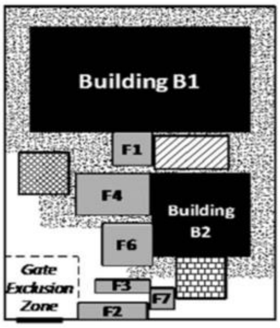
Planning of Storage Area

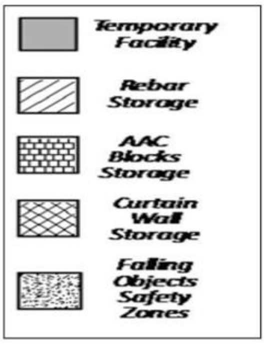
An application instance was examined to determine the abilities of current CLP method in optimizing &integrating procurement, and layout decisions whereas deliberating their mutual inter dependencies. The outcomes of this investigational so demonstrate that material procurement decisions have influenced by difficulty of construction actions consuming the substances &site space accessibility, while dynamic site layout decisions have influenced by material storage space & material procurement decisions and requires and other site layout constraints.

A construction site must be divided into 3 zones or regions: interior (workface) storage, staging areas, & exterior (semi-permanent) storage. Every region has a distinctive function relative to site material management. The details are shown in Figure 6.



(i) Stage1   (ii) Stage2





(iii)Stage3 (iv) Symbols

Conclusions

A novel method of construction logistics planning has improved to permit the optimization &integration of difficult “planning decisions of material storage on construction sites &material procurement”. The procurement decision variables in established method have planned to classify the fixed-ordering periods of every material in each construction phase to deliberate the fluctuating demand prices of materials over project period. The “layout decision variables” have planned to recognize the orientations, material storage regions & other temporary abilities in every construction phase to deliberate dynamic site space requirements. The current method uses EOQ to produce “optimal material procurement and layout decisions” to reduce construction logistics prices, which incorporate stock-out, material ordering, financing, and layoutprices.

REFERENCES

1. L.C.Bell and G.Stukhart, “Cost and Benefits of Material Management system”, JournalofConstructionManagement,ASCEvol.113, no.2.(1987),pp.222-234.
2. B.E. Johnson, ‘Optimizing Tool Availability and Lead Time with Procurement Option’ IEEE International Symposium on Semiconductor Manufacturing (ISSM), (2005), pp.119-122.
3. W Fei&W.Shileii, “Applying logistics to construction material purchasing and Supplier Evaluation”, International Conference on System Science, Engineering Design and Manufacturing Informatization (2010),pp.199-201.
4. G.Polat1. and D.Arditi, “Simulation-Based Decision Support System forEconomical Supply Chain Management of Rebar”, Journal of Construction Management, ASCE vol. 133, no. 1, (2007), pp.29-39.
5. H.Said. and K.E Rayes, “Optimizing Material Procurement and Storage on Construction Sites”,Journal of Construction Management, ASCE, vol. 137, no. 6,(2011), pp.421-431.
6. H.R.Thomas and V.E.Sanvido, “ Impact of Material Management on Productivity”, JournalofConstructionManagement,ASCE.vol.115, no.3,(1989),pp.370-385.
7. H.R. Thomas and D.R Riley, “Fundamental Principles of Site Material Management”, Journal of Construction Management, vol. 131, no 7,(2005), pp.808- 815.
8. H.R. Thomas and M.J Horman1, “Role of Inventory Buffers in Construction Labor Performance”, Journal of construction management,ASCE, vol.131, no. 7,(2005), pp.834-843.
9. H.P.Tserng, S Y. L. Yin, and S.Li, “Developing a Resource Supply Chain Planning System for Construction Projects”, Journal of Construction Management ASCE ,vol. 132, no. 4,(2006), pp.393-407.
10. P.P.Zouein1 and I.D.Tommelein,“Loss of labor productivity due to delivery methods”,JournalofConstructionManagement,vol.125,no.6,(1999),pp.39-46.
11. N.D.Vohra,“QuantitativeTechniquesinmanagement”,McGrawHillPublishers,New- Delhi(2010).