

Supply Chain Management To Minimize Total Transportation Cost of Cement Plant

Vijay Kumar Sahu

*Scholar of Production Engineering Department
Sagar Institute of Research & Technology-Excellence, Bhopal, India.*

Richard Victor

*Department Of Mechanical Engineering
Sagar Institute of Research & Technology-Excellence, Bhopal, India.*

Abstract- Supply chain is a network in which activities associated with the transformation of commodities from raw material to final customers are dealt. The term supply chain refers to the entire network of companies that work together to design, produce, deliver and service products to end customers. The objective of this dissertation is to decide supply of material (cement in this case) from plant to the end customer when there is sudden increase in demand and transportation cost is to be minimized. To estimate how much quantity of cement will be suddenly required in future, analysis on the basis of previous record and distribution data of material (cement) from plant to distribution centers or distribution centers to retailers or customers is needed. To minimize transportation cost by eliminating unnecessary events which are related to the transportation, can be possible by the application of “Vogel’s method”. After application of Vogel’s method, supply of cement with the systematic plan to required place and time is possible with reduction of unnecessary transportation charge. It is the result of this dissertation. The future scope of this dissertation is to increase economy of the related plant, by the reduction of unnecessary route for transportation of material (cement).

Keywords- Supply chain management (SCM), Flexible manufacturing system (FMS), Inventory, Forecasting, Third party logistics (3-PL).

I. INTRODUCTION

The term “supply chain management” arose in the late 1980s and came into widespread use in the 1990s. Prior to that time, businesses use terms such as “logistics” and operations management instead. Some broader definitions of supply chain as well as supply chain management are preferable, if one wants to maximize the opportunities to improve performance of an organization according to Stock & Lambert (2001) “supply chain integrates the key business processes of any organization from end user through original supplier that provide products, services & information that add values for customers and other stakeholders” The Globalization of business & the increasingly competitive pressure have driven many manufacturing firms to develop an effective supply chain planning to minimize the supply chain cost; supply chain planning is becoming a vital planning of company management. Supply chains have traditionally been fragmented, failing to integrate the business function in logistics chain process. Many problems, such as increased inventory carrying cost, longer order lead time, & difficulty in responding proactively to real time change, have decreased profits & weakened customers goodwill, which can be resolved by many integrating supply chain management system for warehouse & transportation, supply chain shown by figure.

supply chain image.

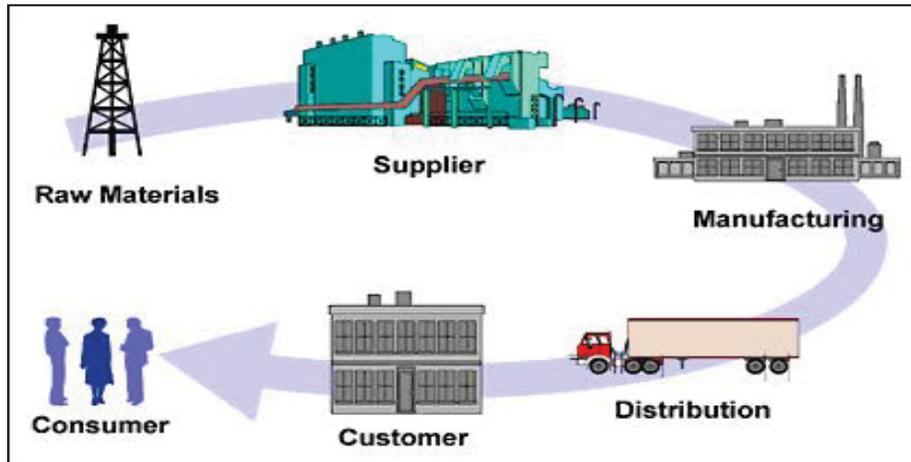


Figure 01: Supply chain.

II. LITERATURE REVIEW:

For the conceptual framework of performance for sustainable supply chain management in cement plant, guideline for operational planning to develop the scm towards pssc of cement industry also improve relation between environmental, social, economics & pssc-scm [1]. On The Supply Chain Management forum what are possibilities capable for to provide the quick response over the last several decades, globalization has led to supply chains that have become increasingly complex [2]. If any time to fluctuation is take place about requirement of any product at this condition demand variability in supply chains has been discussed in the paper. This paper also discusses these conceptual measurement problems and discusses experiences in dealing with some of these problems in an industrial project. Also presents empirical results of measurements of the bullwhip effect in two supply chains. [03]. A comprehensive review of distribution problems in logistics and supply chain management is presented in this paper, also importance and difficulties of distribution and research are discussed [04]. Forecasting of material for future demand on the basis of previous record and planning of supply of material in a systematic way also how much quality & quantity of material required in market. Reduction of lead time [05]. This paper is projected on supply chain optimization on its role in reducing cost in cement industry.[6]. Now a day's every firm construct a structure For measure the performance of supply chain management network, in the way of product and services, with the reduction of total transportation cost [07]. For development of supply chain management it is essential that their links are better connected to each other [08]. Analysis on the drivers of supply chain which are provide a good structure for the organization which is also manage these drivers for their survival [09]. Importance of supply chain for transportation in business 10]. Minimize total transportation cost between every echelons as suppliers, manufacturer, distribution centers & customers, minimize of holding and ordering cost, & use capacity of pant and distribution centers [11]. This paper focus on research analyses the cement supply chain operations using the various frameworks as: push-pull supply chain, the Life Cycle Assessment (LCA) methodology [12]. The object of this paper is to introduce of supply chain management which consist of several suppliers, production plants, distribution centers and retailers. Also a mixed integral two stage programming model is developed to optimize simultaneously two objects (a) minimization the fixed and variable cost, (2) maximization the service level. [13]. Analysis some literature in supply chain optimization & propose the use of multi objective evolutionary [14].

III. THE EXISTING SUPPLY CHAIN MANAGEMENT SYSTEM

The existing model of supply chain management which is indicate the supply of material between supplies and final customer is represent by diagram at the initial condition it is considered that three suppliers are supply row material to the relative plant or plats, plants are manufacture product from row material to semi finished or finished product by the various processes or operations, the product is to transfer to ware house or distributions centers then the products is to transfer to final customers. This condition is represent by block diagram as:

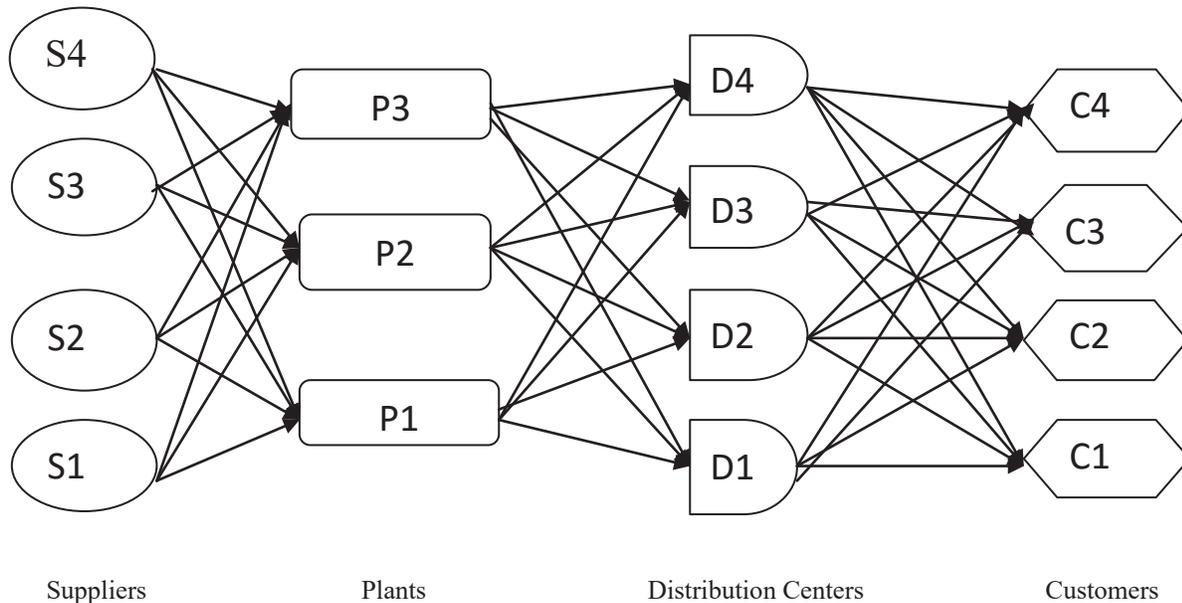


Fig. 02- material transportation.

After forecasting of requirement of cement of previous years, keep forecasting of coming years means what are the approximate quantity of cement will be require in how much ration in future is estimate by the forecasting with the help of previous record.

3.1 DEMAND ANALYSIS OF CEMENT PLAN

S no.	Year	Quantity
01	2004-2005	14289885
02	2005-2006	14879562
03	2006-2007	15787566
04	2007-2008	15989850
05	2008-2009	16098770
06	2009-2010	16499800
07	2010-2011	16599880
08	2011-2012	17667830
09	2012-2013	18310800
10	2013-2014	19980900

Table 01- forecasting data demand of previous years of cement plant

For to analysis the demand of cement plant, firstly to collect previous record of selling of cement that how much quantity of cement is to be sell by relative cement plant and how much quantity of cement has been require by the customers in the gradually form in previous year. on the basis of previous record of selling of cement, it is estimated that how much quantity of cement will be required in coming years also in how much ratio. On the basis of previous record, find out data of required of cement by customers as:

3.2 APPLICATION OF FORECASTING TECHNIQUE TO KNOW THE DEMAND FORECASTING YEARS

Regression analysis by last square method.

Where-

$$y = a + bx$$

a=Demand.
b=Supply.
x= Deviation.

The value of the constant a & b are determine by the 2 simulation equation.

$$\Sigma y = Na + b\Sigma x \dots\dots\dots(01)$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2 \dots\dots\dots(02)$$

these 2 equation are called normal equations, to compute the value of a & b.

- To calculated the deviation (x) for each period & also the sum of deviation.
- find the value of Σx^2 .
- find the value of Σxy .
- calculated the value of a & b.
- make the sum of deviation $\Sigma x=0$.

There are various tools which are responsible to over handle effective material handling process with minimization of transportation cost are:

At the initial condition 4 suppliers AS: S1,S2,S3,&S4 are present at Rewa, Indore , Vapi & Vadodra respectively, they supply the row material to the different-different production plant, these production plants are P1& P2 established at Rewa & plant P3is established at Santa Madhya Pradesh.

Also,4 distributions centers are install at different place whose as: D1,D2,D3&D4 are install at Bhopal, Jabalpur, Indore & Gwalior respectively.

Also, 4customers are require the product from the distributions centers, these 4 customers as: C1,C2,C3&C4 are present at Vidisha, Damoh, Ujjain & Datia.

IV. METHODOLOGY

For distribution of material or product from firm to distribution centers or distribution centers to retailers or customers with the help of a method mane as Vogel's method, it is practically truth that Vogel's method is very suitable for prevent un necessary or repeat condition of distribution of material. Vogel's method is provide the material distribution relation between suppliers and customers, also represent the condition of how many requirement of relative customers and how many supply will be keep by suppliers to customers that the total transportation cost will be minimum as compare to previous condition.

V. MODIFICATION OF SUPPLY CHAIN MANAGEMENT SYSTEM OF CEMENT PLANT.

The main object of this desistration that to minimize total transportation cost mean save economy of the plant, at this condition to install a new plant it is costly or to increase a distribution centre it is also coastly. Only one condition is suitable for this desistration objectives that to increase the production capacity of the production plants.

At this condition the increase customer is show in the diagram.

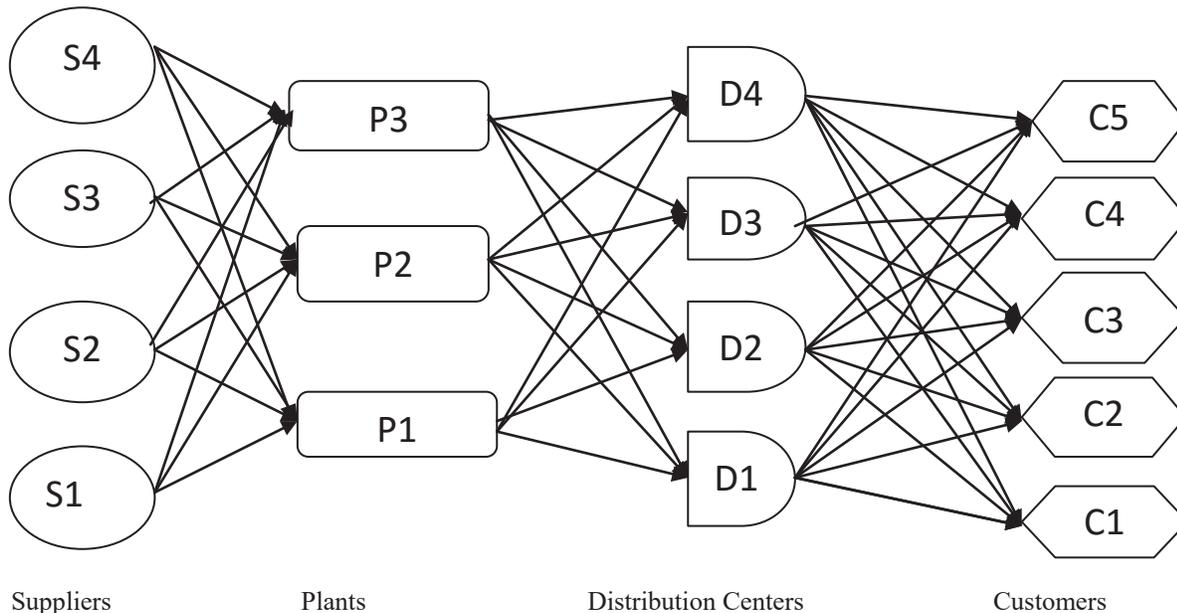


Figure. 03- material transportation.

After modification of transportation system, in which show the conditions than a customer is increase, then what quantity of cement will be required in future it estimated by previous record and application estimating tools which also use to distribution of cement with the lower transportation cost.

VI. CALCULATION FOR EXTING CONDITION

$$\sum_s \sum_k t_{sk} b_{sk} + \sum_k \sum_j a_{kj} f_{kj} + \sum_j \sum_i c_{ji} q_{ji}$$

where-

s= suppliers

k=manufacturing plants

j= distribution centre.

6.1 FORECASTING FOR REQUIREMENT OF CEMENT FOR COMING YEARS

For estimate the requirement of cement in future, it is compulsory to forecast of market demand with the help of previous data, then estimated that how much approximate demand of cement will be require in future.

For modify supply chain management system-

$$\sum_{i=1}^j \sum_{k=1}^l f(i,k) \times d(i,k) + \sum_{k=1}^n \sum_{m=1}^n f(k,m) \times d(k,m) + \sum_{m=1}^n \sum_{ia=1}^{ib} f(m,ia) \times d(m,ia)$$

Where-

i=Suppliers

k= Manufacturing Plant

m =Distribution Centers

ia= Customers

j=No. of Suppliers =5

l=No. of manufacturing plant =3

n=No. of Distribution Centers =4

ib=No. of Customers =5

this updated condition is capable to solve the problem of fluctuation in future.

VII. RESULTS

The distribution or transportation of materials or products from one place to another place is travel some particular distance in yourself, but, if the same materials or products will be transfer or distribute from same place to same place with the applying the supply chain management system, it is practically truth that to reduce the un necessary movement or re process of materials or products, it is true that every movements of transportation of materials are responsible for increasing transportation cost. due to reduction of un necessary movement or reprocess for transportation or distribution of materials or product is represent minimization of total transportation cost, which the main goal of this research.

VIII. CONCLUSION

On the basis to this research it is done the cement industries lacks of supply chain management, the main goal of this paper is to optimize the supply chain management in cement industry and to provide the best solution for supply chain management, including the various properties of product and firm, also keep help for to provide data for market competitiveness between other cement production firm.

IX. FUTURE SCOPES

The transportation of materials or products is continue from Former times and some charges are also take place with respected to the time. The discovery of supply chain management in 1980's, while implement on SCM from 1990s. after applying the SCM a revolution is arise in the field of transportation , it means a reformation is take place in the

field of transportation, ultimately there various unnecessary or reprocess are reduce by the application of the supply chain management by which the total transportation cost is reduce per unit per item. The research “supply chain management” is also effective for storage of materials at any storage place or warehouse; it is helpful for reduction of storage cost of every item.

REFERENCES

- [1] Thanyaphat Muangpan, Mana Chaowarat and Jataporn Neamvonk “A Framework of Performance for Sustainable Supply Chain Management Thai Cement Industry” World Journal of Social Sciences Vol. 4. No.3. October 2014
- [2] Dr.Uzorh,A.C1and Nnanna “Supply Chain Management Optimization Problem Engr. Innocent” The International Journal Of Engineering And Science (IJES) Volume 3 Issue, 6 Pages 01-09 2014.
- [3] Tarek Elhasia, Bernd Noche, and Lima Zhao “Simulation of a Sustainable Cement Supply Chain; Proposal Model Review, Approach to innovative supply chain strategies in cement industry; Analysis and Model simulation.” World Academy of Science, Engineering and Technology, Vol:7 2013-03-28.
- [4] Xu Yang “A Review of Distribution Related Problems in Logistics and Supply Chain Research” institute of journals supply chain management Vol. 2, No. 4, December 2013.
- [5] Mohamed Zied Babai & Mark Moon “Demand forecasting and planning in the supply chain” Supply Chain Forum an International Journal, Vol. 12 - N^o4 – 2011.
- [6] J.CHENY and A.PAULRAJY “Understanding supply chain Management: critical research and a theoretical framework.”2004, vol. 42.
- [7] Tarek Elhasia, Bernd Noche “Sustainable of a Cement Supply Chain; Proposal Model Review”, World Academy of Science, Engineering and Technology, Vol:7 2013- 03-28.
- [8] G.Pinto “Supply Chain Optimization using Multi-Objective Evolutionary Algorithms Errol” An International Journal, Volume 5. Number 2.
- [9] Irum Shahzadi, Saba Amin, Kashif Mahmood Chaudhary “Drivers of supply chain performance enhancing organizational output: An Exploratory study of manufacturing sector” European journal of business and management, Vol.5, NOV.14, 2013.
- [10] Deepesh Giri Sharma,G K Sahu “Quality in Supply Chain: Case Study of Indian Cement Industry” International Proceeding of Economics Development and Reserch, 2014.V75.28.
- [11] Turan Paksoy Eren Ozceylan, Gerhard-Wilhelm Weber “A Multi-Objective Mixed Integer Programming Model For Multi Echelon Supply Chain Network Design and Optimization”.
- [12] F.Alborzi, H Vafaei, M.H. Gholami, M.M.S. Esfahani “A Multi-objective model for supply chain network design under stochastic demand” world academy of science, engg. and technology. Vol: 5 2011-22-27.
- [13] Errol G. pinto. “Supply chain optimization using multi-objective evolutionary algorithms” department of industrial engg. the Pennsylvania state university, university park, PA, 16802.
- [14] N. Sahoo,T Sshekhar, S. Sahu “an approach to multi objective facility layout planing’ industrial engg. Jourjal journal vol.xxxi no. 4 april 2002.