



# SYSTEMATIC STUDY TO IMPROVE THE PERFORMANCE OF A CEMENT MANUFACTURING COMPANY THROUGH SELECTIVE INVENTORY CONTROL

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## ABSTRACT

Materials management has always remained a perplexing problem to all organizations, especially to a cement manufacturing unit. Now a days organizations are facing problems of survival because of acute competition. Only those organizations can meet the competition effectively and can hold on the market, which is in their position to keep their cost minimum. Material is the first and foremost element of cost amounting to almost 50% of the total cost. In this context it is worthwhile to make a study of the inventory management system in a firm undertaking for improvement. With this end in view, it is thought desirable to undertake a study of **Travancore Cements Limited** which has been successful throughout its existence.

To attain the objectives of the study both primary and secondary data has been used. Secondary data was obtained from published reports and journals. To have an in depth analysis of the existing practices it was necessary to collect primary data relating to the actual functioning of the purchase and inventory control system.

A schedule containing questions of different aspects of the purchase and inventory control system was constructed. By interviewing the persons answers are collected to these questions. The answers obtained were tabulated to draw the relevant conclusions. These results form the basis of the study.

The secondary data collected were analysed with simple statistical tools ie, with the help of tables, bar charts,trend ratios,mean etc.helped the researcher to present the results of the study in a more meaningful manner.

The effectiveness of the inventory management of the company is checked and analyzed using ratio analysis. Selective inventory control methods of one dimensional, two dimensional & three dimensional methods are performed to improve the inventory system of the company.

## INTRODUCTION

### 1.1 PROBLEM IDENTIFICATION

In the field of working capital, efficient management of inventory poses a Challenging problem to the public sector organization particularly in India in the absence of any guiding principles from the government in this regard. The lack of conscious efforts by public units to control the growth of their inventory volume, and the diversity in the field of public industrial activities has added to the complexity of the problem. The inventory constitutes major part of working capital.

Travancore cements Ltd is suffering loss for the last 5 to7 years. There is no comprehensive study at present about the performance of materials management particularly in the purchase and inventory control .In TCL material cost constitutes above 40% of total working capital. Company is following outdated tools and procedures in inventory management. The reason for increase in material cost may be increase in price or due to inefficient material control.

Company is not following any selective inventory control techniques Absence of proper control of materials is noted in the organization. Different types of materials have different usage value, criticality to production, obsolescence, inventory value and unit cost. In order to get proper control different characteristics have to be combined.

### 1.2 OBJECTIVES

- 1) To examine the performance of materials management, particularly purchase and inventory control system at TCL.
- 2) To make a comprehensive study between the theoretical side of purchase and inventory control with practices in TCL.
- 3) To conduct selective inventory control techniques — ABC analysis, XYZ analysis, FSN analysis, HML analysis and VED classification. To combine different inventory control techniques i.e., ABC —VED matrix, ABC-XYZ matrix, XYZ — FSN matrix and MUSIC 3D analysis.

### 1.3 SCOPE OF THE STUDY

The present era of tough competition and rapid development both in terms of technology and production processes, every business enterprise irrespective of its size and function has to follow some organized and systematic approach to examine the performance of materials management and ascertain the important constraints of the system for mere existence.

#### Main areas covered in this project are;

- a) **Purchasing:** This includes selection of source of supply, finalization of terms of purchase, placement of purchase orders, follow up, maintenance of smooth relation with suppliers, approval of payments, evaluating and rating suppliers.
- b) **Inventory control:** This includes physical control of materials, preservation of inventory, minimization of obsolescence and damage through timely disposal and efficient handling, maintenance of inventory records, proper location and stocking.

An attempt is made to analyze the material consumption pattern of TCL based on annual reports of the years 2018-19, 2019-20, 2020-21 & 2021-22 through ratio analysis and, materials and spare parts are divided into different classes based on various criteria.

## METHODOLOGY

### 2.1 DEFINITION AND NEED FOR INVENTORY **Definition**

Inventory is the most important component of working capital and has an important contribution to the maximization of profit of a business organization. The word inventory represents the aggregate of those items of tangible personal properties which are held for sale in the ordering course of business (b) are in the process of production for sales or (c) are to be currently consumed in the production of goods or services to be available for sales.

In financial point of view, inventory is defined as the sum of the value of raw materials, fuels and lubricants, spare parts, maintenance consumables, semi processed materials, and finished goods stock at any given point of time

#### **Need**

As such the cost of inventory represents capital tied up in the business. It is therefore, necessary that there should be a proper inventory control system for combined economy and service to the organization.

The function of inventories has two aspects...

- (a) Inventories are necessary because, it takes time to complete an operation and to move product in process from one stage to another.
- (b) Inventories employed for organizational reasons, such as to let one unit schedule its operations more or less independently of another or organization inventories.

Inventories are important to management of an organization primarily because of the several ways. Firstly too much or little inventory affects the return on investment. The rate at which inventory moves through the production and distribution process also affects the cost of doing business. For any volume of sales the amount of working capital required for efficient operation is less when inventory turn over is higher of than when it is low.

### 2.2 NATURE OF INVENTORY MANAGEMENT

As such inventories are vital elements in the effects of an organization to achieve desired sales levels depending upon the nature of industry. Inventories may be durable or indurable, perishable or non perishable, valuable or inexpensive, whatever the nature of inventories, the accounting process is careful to distinguish between goods held for resale from the current assets such as office supplies or furniture, which are not sold but are used to help to organization to conduct its business .Nature of inventories included is the following,

### **Raw materials**

Raw materials are those basic input materials that are converted into finished goods produced through manufacturing process. Raw materials are therefore those units of output which have been purchased and stored for future production. An organization should maintain adequate stock of raw materials for a continuous supply to the factory for an uninterrupted production.

It is not possible for a company to produce raw materials whenever they are needed. A time lag exists between demand for materials and their supply. Also there exists uncertainty in procuring raw materials in time at many occasions. The procurement may be delayed because of strike, transport disruption, short supply etc. Therefore the organization should maintain sufficient stock of raw materials at a giventime to streamline the production.

### **Work in progress inventory**

Work in progress inventories are semi manufactured inventories. They represent products that need more work before they become finished products for sales.

Work in progress inventory is built up because of the production cycle. Production cycle is the time span between the introduction of raw materials into production and the emergence of finished product at the completion of production cycle .Till the production cycle complete, the stock of work in progress has to be maintained.

### **Finished goods**

goods inventories are those completely manufactured products, which are

ready for sale. They are the final output of the production process in a manufacturing organization. In case of wholesalers and retailers they are generally referred to as merchandise inventory.

### **Stores and Spare parts**

Stores and Spare parts include loose tools and small parts which are essential for production.

### **Objectives of Inventory Management**

- (a) To keep down capital investment in industry
- (b) To minimize the possibility of disruption in the production schedule of a firm.

### **Purpose to hold inventories in an organization**

For effective and adequate inventory management it is a must to maintain sufficient raw materials in period of short supply and anticipate price changes, maintain sufficient finished goods inventory for sales operation. For achieving efficient production, reduce order cost, gain quantity cost and avoid losses of sales, adequate inventory of raw material, must be maintained. So it is necessary for all manufacturing concerns to keep optimum level of inventory to earn good profit and to make balance in the business.

### **General Procedures**

An organization objective should be in consonance with the wealth maximization principles. To achieve this, organization should determine the optimum level of inventory. Sufficient inventory should be maintained. It should be neither excessive nor inadequate. To maintain inventory efficiently and effectively answer should be suggested to the following two questions.

- (a) How much should be ordered? -
- (b) When it should be ordered?

i.e. Economic order Quantity and Re-order point.

### **Economic order Quantity**

The economic order quantity refers to the size that will result in the lowest total of order and carrying cost for an item of inventory. If an organization places

unnecessary orders it will incur unwanted order costs. If it places too few orders, it must maintain large stocks of goods and will have excessive carrying costs. By calculating EOQ an organization identifies the no of units to order that results in the lowest total of these two costs.

**(a) Demand is known**

Although it is difficult to predict accurately the organization level of sales for individual items. The working manager should provide a sales forecast using past data and future plans. A reasonably accurate prediction of demand can often be made in terms of units sold for year

**(b) Sales occur at constant rate.**

This model may be used for goods that are sold in relatively constant amounts throughout the year. A more complicated model is required for an organization whose sales fluctuate in response to seasonal or other cyclical factors.

**(c) Cost of running out of goods is ignored**

Cost associated with shortage, delays or lost sales are not considered.

These costs are considered in determination of safety level in the re-order point.

**(d) Sub system stock level is not considered.**

The safety stock level is the minimum level of inventory that an organization wishes to hold as a protection against running cost.

$$EOQ = \frac{2DC_o}{C_c}$$

$C_c$

$D$  = Annual requirements of an item or unit.  $C_o$  = ordering cost per unit

$C_c$  = carrying cost per unit.

**Re-order point sub system.**

An important question in an inventory managed system is when an order should be placed so that an organization does not run out of goods. The answer is experienced in terms of units of inventory provided by re-order point subsystem. The reorder point is the level of inventory at which an order is placed in the amount of EOQ. If an organization places the order when the inventory reaches the re-orderpoint, the new goods will arrive before the organization runs out of goods to sell. In designing a reorder point subsystem, items of information are required as inputs to the subsystem that are.

**(a) Usage rate**

This is the rate per day at which the item is consumed in production or sold to customers. It is expressed in units.

**(b) Lead time**

It is the period of time between placing an order and receiving the goods. Purchase department usually provides their information. The time to allow for an order to arrive may be estimated from a check of the company re-order and the time taken by different suppliers to fill the orders.

**(c) Safety stock level**

The minimum level of inventory may be expressed in terms of several day's sales. The level can be calculating by multiplying the usage rate by lead time by adding the number of days that an organization wants to hold a protection against shortly.

Re-order point = usage rate \*(Lead time + safety days)

## **INVENTORY MANAGEMENT**

For the appraisal interpretation and review of the effectiveness of inventory management of TCL, the following ratios are worked out.

- 1) Aggregate inventory to current assets ratio.
- 2) Percentage share of individual component (Raw material, spare parts, general store items) of inventory to aggregate inventory.
- 3) Raw material turn over ratio.
- 4) Raw material storage period.
- 5) Stores and spares turn over.
- 6) Stores and spares storage period.
- 7) Inventory turn over ratio.
- 8) Inventory to working capital ratio.

A comparative study of the inventory management performance of different years 2005-2009 is undertaken. Various statistical tools are used for this purpose such as percentages, bar charts, combined bar charts, line charts etc.

For getting proper control of materials, selective inventory control techniques are to be applied i.e.

- a) ABC analysis of the items is conducted with recent data .
- b) VED classification of spare parts is conducted to classify spare parts on the basis of criticality or production loss analysis.
- c) XYZ analysis is performed based on the value of inventory undertakenduring the closing of annual accounts.



- d) HML analysis is done where items are classified according to the unit values as high, medium and low. ,
- e) FSN analysis is conducted to identify the obsolescence of items.
- f) For getting more control, either two analyses can be combined which is known as control matrix’.
- i.e. **ABC - VED matrix, ABC-XYZ matrix, XYZ – FSN matrix etc. MUSIC**  
— **3D** (Multi Unit Selective Inventory Control —Three Dimensional) is also formed.

## INVENTORY CONTROL

### 4.1 INVENTORY CONTROL TECHNIQUES

Selective Control means variances in the method of control from item to item based on selective basis. The criterion used for the purpose may be cost of the item, critically, lead time, consumption procurement difficulties or something else. Controlling the area of operation for good performance means time required, money & efforts required to the operations should be of that kind that they have less time. Therefore to achieve objective they must control not the entire area of operations but only that area of operation, which is not controlled is likely to cause damage

Thus selective control means selecting the area of control so that required objective is achieved as early as possible without any loss of time due to taking care of full area —

- Minimum loss of energy and efforts.
- At minimum cost without loss of time.

In materials management depending upon the objective of materials management there are various techniques of selective control these are listed below

#### 4.1.1 One dimensional selective inventory control methods.

1. ABC analysis.
2. VED analysis.
3. HML analysis
4. FSN analysis.
5. XYZ analysis.

#### 4.1.2 Two dimensional selective inventory control methods Control matrix

It can be easily visualized that the various types of analysis discussed are not mutually exclusive. They can be, and often are used jointly to ensure better control over materials.

- a) ABC and VED analysis can be combined together.
- b) ABC and XYZ analysis can be combined together
- c) FSN and XYZ Analysis can be combined together

#### 4.1.3 Three dimensional selective inventory control method MUSIC 3D Analysis

MUSIC 3D which stands for ‘multi unit selective inventory control’ is a three dimensional approach. The three dimensions are being finance, operations and availability.

The three dimensions can be seen below

	High Consumption Value(HCV)		Low Consumption Value(LCV)	
	High Lead Time (HLT)	Low Lead Time (LLT)	High Lead Time (HLT)	Low Lead Time (LLT)
Critical	1	2	5	6
Non critical	3	4	7	8

Based on ABC analysis we get HCV or LCV items. Critical and non critical items are based on VED analysis.

HLT and LLT classification is based on availability. MUSIC 3D analysis can be taken as an extension of control matrix and can focus more effectively.

For cells 1 & 2 – AV classes

For cells 3 & 4 – AE & AD classes For cells 5 & 6 – BV & CV classes

For cells 1 & 2 – BE, BD, CE & CD classes

High lead time means greater than 14 weeks and low lead time means lead time less than or equal to 14 weeks.

#### a) Cost Reduction by MUSIC 3D

Items in cell 1, 2, 3 and 4 number around 20% with an annual consumption of 80% while the remaining items in other cells numbering 80% account for an annual

consumption of only 20%.

There need not be any cost reduction techniques like value analysis for items in cells 5, 6, 7 and 8 as the cost of cost reduction methods is likely to be greater than the cost of items itself.

Items in the cells 1, 2, 3, 4 are potential candidates for applying cost reduction techniques. But it may be dangerous to apply cost reduction techniques for highly critical items falling in cell 1 and 2. cost reduction can be applied on items grouped in cells 3 and 4.

### **b) Inventory control by MUSIC 3D**

Inventory levels can be liberal for low value items in 5.6.7.8. Two Bin system is ideal for these items. Items in cell 5 can be stocked more since they represent critical long lead time items though with low consumption value. If possible avoid stocking items falling in cells 7 and 8 (especially 8. since they have short lead rime)

Issue of materials falling: in cell 1.2.3 and 4 should be very strict, since they constitute high consumption value. If possible try to eliminate items falling in cell 3 and 4 (high value non critical) For items in cell 1 and 2 rigorous monitoring and review is required. Service levels should be maximum for items under cells I. 2. 3 and

4. Issue of items falling under cells I and 2 more sources are advisable. FSN analysis must be done once in 6 months for items in 1. 2. 3 and 4 to locate the slow moving, surplus and obsolete items. Physical verification should be done once in 3 months for items falling in cells 1.2.3 and 4

The A class of items incorporate a large turnover value in them. Naturally, the management attention must be focused on these items. This is possible as they are very few in number, hold up production and may be substituted as well. Therefore, we can manage with small inventories of these items without drastic consequences on the running of the production line.

Therefore A class of items are always under the scrutiny of the management. They are always monitored and followed up with respect to their stock levels, their availability in he market, their substitutes if any etc. Since these are directly and constantly under the vision of the management, they can be kept in smaller quantities in inventory. Class C items contribute very little to the total annual consumption value and even if they are kept n large quantity in the inventory, it really doesn't significantly add to the inventory related cost. It is better that they be purchase and

procured in large quantities. say once in a year and thus cut down the number of transactions and management follow up. Therefore the service levels of C class items will be high. B class items fall somewhere in between in terms of the service levels.

## STUDY OF EXISTING SYSTEM AND PROBLEM IDENTIFICATION

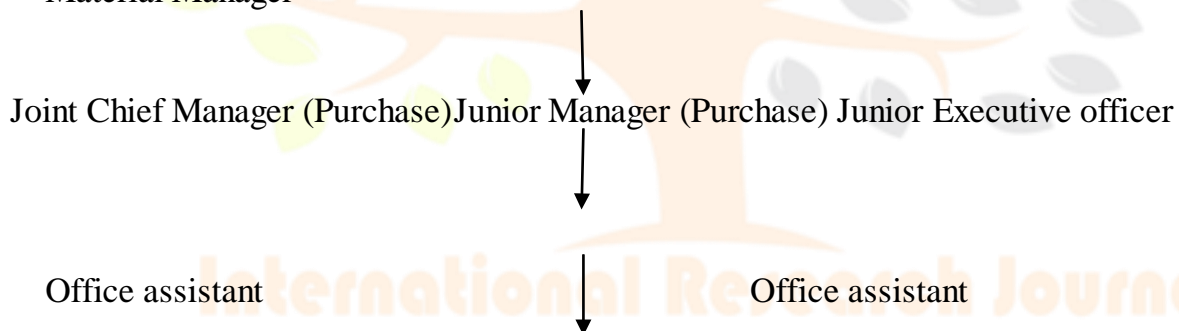
### 5.1 EXISTING SYSTEM IN TCL

#### 5.1.1 Purchase Control in TCL

Purchase control covers on all aspects of purchase. Purchase are made by the Purchase Department. Purchase and inventory departments come under materials management in TCL. In TCL the two departments have a common head. This department looks after all activities relating to raw materials and other general consumable things.

In TCL there exists a centralized purchase department. The purchase department authorities flows as below:

Material Manager



#### Advantages of Centralised Purchasing in TCL

- 1) When materials are purchased in favourable terms eg. more trade discounts or economies in transport can be obtained because the quantity involved will be large.
- 2) The purchasing department can be staffed with highly paid officials who are experts in the art of purchasing the materials. Specialised knowledge and skill of these persons can be utilized.
- 3) Better control on purchasing is possible.
- 4) All records with regard to purchase are kept at one place under the supervision of the

purchase officer.

- 5) Helps in achieving in following uniform purchasing policies, practices & procedures.
- 6) It avoids duplication of efforts and is helpful in achieving product standards.

### **Functions of Purchase department in TCL**

1. Placing orders
2. Inviting quotations
- 3 Correspondents

To perform the function effectively, the purchasing department follows the following procedures.

- a) Purchase requisitions or indenting for material

With the help of purchase requisitions, the purchase officer comes to know the types of materials needed by the organization.. This form is prepared by the storekeeper for regular stock materials and by the departmental heads for special matters not stocked at regular intervals. An executive such as the plants superintendent or works manager approves the requisition. In TCL seven to eight copies of the requisition are kept at various departments and one at inventory department. The inventory keeper records on the inventory indent the following things.

- 1) Description of item/materials
- 2) Units
- 3) Quantity required
- 4) Required for which department / jobs
- 5) Stock position
- 6) Requisitioned date

In the prescribed form he requests to the purchase department and informs them about current suppliers and list of suppliers for orders.

- b) Exploring the source of supply and choosing the supplier

In TCL the processing of choosing the supplier is a hard task. The storekeeper generally mentions the name of current suppliers, their price quotations etc. Choosing the right supplier from suppliers involves a process of comparative statement for purchase. It is a statement prepared by the purchase department. And then their decisions are passed through different departments such as inventory department, consuming department and finance department. The remarks of various authorities are evaluated and finally the purchase department takes actions. Every initial order is submitted to financial manager and sealed by manager internal audit. At last inventory purchase is initiated to chief

manager productions and purchase IC and he takes decision regarding whether to invite tenders and quotations not.

- c) Purchase orders
- d) Receiving and inspecting materials
- e) Checking and passing bills for changes

### **Conditions Regarding Receipt of Goods**

- 1) If the suppliers are within Kerala, time within 15 days of sending / inviting quotations
- 2) If the suppliers are outside Kerala, a period within 20 to 30 days.
- 3) The company makes local purchase itself through its agents, time 2 to 3 days

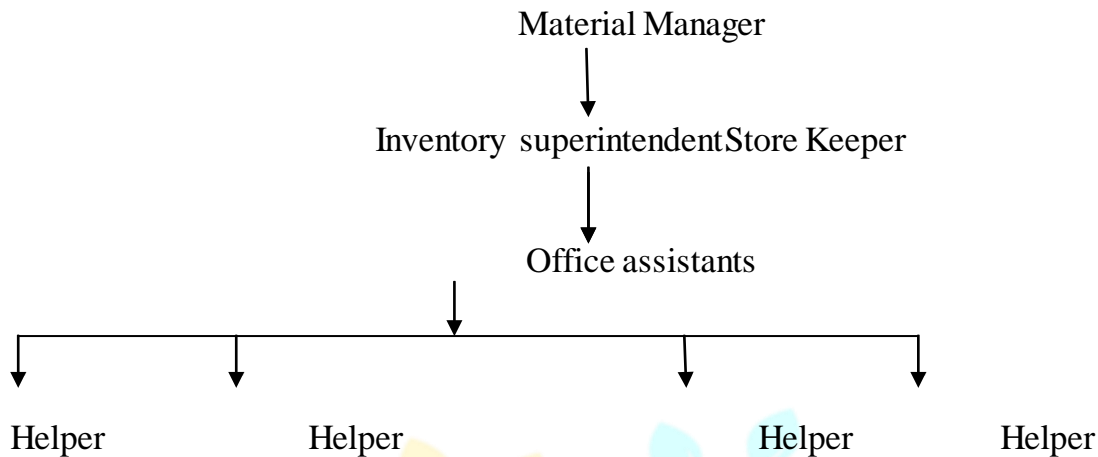
### **Purchase limits**

TCL follows an authorized purchasing system. The purchase units are as follows.

- 1) Below and up to 5000: Purchases are maintained by Junior Manager and sanctioned by Joint Chief Manager (Purchase)
- 2) Rs. 5000 to 100,000: Materials Manager should sanction it.
- 3) Rs. 100,000 and above: approved by subcommittee/ Board of Directors



### 5.1.2 INVENTORY CONTROL IN TCL



In TCL, inventory department is near to the consumable department. In TCL, there exists centralized storage system, so that materials are received by and issued from one inventory department. All materials are kept at one central inventory.

At TCL, where inventory department is concerned with purchase and storage of general items needed in the factory. The general items needed for the factory are classified under 22 classes.

Class 1 – Oils & Lubricants Class 2 – Nuts & Bolts

Class 3 – Pipes & Pipe fittings

Class 4 – Steel plates, Angles & Flats Class 5 – Electrodes & General items Class 6 – Electrical Items

Class 7 – Grinding media Class 8 – Barge Pad

Class 9 – Tools & Accessories Class 10 – Stationery

Class 11 – Shelcem Chemicals Class 12 – Castings

Class 13 – Dredges Parts Class 14 – Cat Engine spares Class 15 – BEML-spares Class 16 – Hydraulic spares  
Class 17 – Cumming Engine spares Class 18 – Mobile Engine parts Class 19 – Fork Lifts vehicle parts Class 20 – Bearings  
Class 21 – FLS spares Class 22 – Sundry spares

### **Advantages of centralized inventory in TCL**

- 1) Better control can be exercised over inventory because all inventories are housed in one department.
  - 2) Better layout of inventory is possible
  - 3) Investment in stock is minimized
  - 4) Economy in cost
  - 5) Economy in staff and concentration of experts in one department will lead to development in high technical skill
  - 6) Less botheration in inventory checks as the entire inventory are located in one place
- Inventory Records

The bin card and karde -x-card are the two important stock records that are kept in TCL for making a record of the various items of the stores

#### **a) Bin Card**

Quantity of inventory received is entered in the receipt column and the quantity of stock issued is recorded in the issue column of the bin card and the balance of the quantity of inventory is taken after every receipt or issue, so that balance at any time can be readily seen. For each item of inventory, minimum quantity & maximum quantity are stated on the card. A bin card is usually hung up or placed in shell, rack or bin where the material has been kept. In TCL a bin card is used to refer the stock of items grading.

### **CONCLUSION**

### **SUMMARY OF THE PROJECT**

The present existing inventory management system is to be studied and problems are to be identified. The over blockage of funds in inventory, store and spares in particular is to be located by using Ratio analysis. The lack of proper classification of items based on selective criteria is to be found out and the different classification is to be performed. Need for an improved Vendor rating system is identified



in the organization and a software model is to be developed using Analytical Hierarchy Process Technique. A simulation program for spare parts to fix the Reorder level and ordering quantity is to be developed.

The project work will be helpful to the company, since it is the first time, spare parts management, i.e., VED analysis and MUSIC 3D is studied in detail. Being a process industry the down time cost is high which indicates the importance of spares. For the bringing out of a new stores management manual, this project will play a part.

## **FINDINGS & RECOMMENDATIONS**

### **1) FINDINGS**

1. It is revealed that there is blockage of funds in stores and spares due to poor inventory management.
2. The turnover rate and storage period of materials are not according to the standards of a cement manufacturing company.
3. Company is not following any selective inventory control methods for the classification of materials.
4. The vendor rating system in the company is not satisfactory and as a result inefficient suppliers are included in the vendors list.
5. Company is not giving adequate importance to spare parts management.

### **2) RECOMMENDATIONS**

Travancore Cements Ltd is using old and outdated tools, techniques and procedures in Materials Management department. This is due to unavailability of funds and partial computerization. Company could not sustain with this outdated tools and techniques during the changing economic scenario of globalization and liberalization. The company is spending too much money in stocking inventories.

Some recommendations are given below for the future growth of the company.

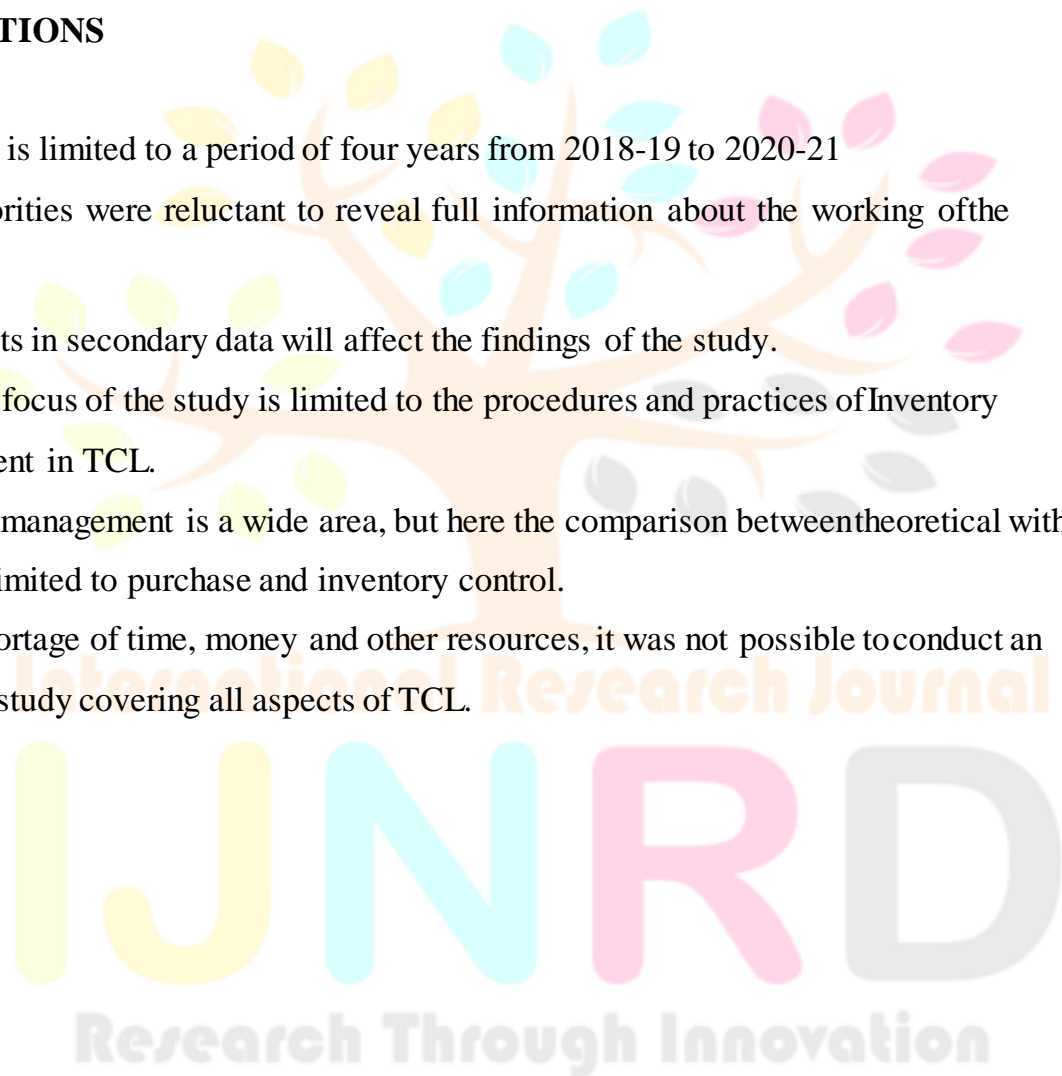
1. In case of emergency items strictly maintain danger stock level.
2. In addition to bin card, the company should maintain inventory ledger also because inventory ledger gives the money value of the inventory.
3. The company should calculate inventory turn over ratio for each item; this will help to strengthen the, material control. Because the stock turn over ratio identifies the material as

slow moving stock, fast moving stock and obsolete stock.

4. Company should adopt selective inventory control methods for better inventory management.
5. To avoid inventory out spare parts, it is better to adopt VED analysis as selective spare part control.
6. FSN analysis must be performed to identify the obsolescence of items.
7. HML analysis must be done to set policies for the purchase department for buying items.
8. The company should carry on a continuous analysis of material consumption pattern for effective materials management.

## LIMITATIONS

1. The study is limited to a period of four years from 2018-19 to 2020-21
2. The authorities were reluctant to reveal full information about the working of the company.
3. The defects in secondary data will affect the findings of the study.
4. The main focus of the study is limited to the procedures and practices of Inventory management in TCL.
5. Materials management is a wide area, but here the comparison between theoretical with actual is limited to purchase and inventory control.
6. Due to shortage of time, money and other resources, it was not possible to conduct an intensive study covering all aspects of TCL.



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