ADDIS ABABA UNIVERSITY
FACULTY OF BUSINESS AND ECONOMICS
MBA PROGRAMME

OPERATIONS MANAGEMENT (MBA 632)

FINAL PAPER ON:
RUBBER INVENTORY MANAGEMENT PRACTICE OF ADDIS TYRE COMPANY,S.C.

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June 2003

Acknowledgement

My sincere appreciation and gratitude goes to my Instructor Dr Tilahun Teklu for giving me the opportunity to assess the real practice of inventory management in Addis Tyre Company,S.C.

I would also like to extend my appreciation to the different people who willingly co-operated me. Special thanks to Ato Chernet G/giorgis, and Ato Kefale Checkol from the Supplies Department; Ato Elias Tegegnework, W/t Meskerem Gobena, and Ato Gizachew Ayele from Production Department; and W/ro Genet Asres and W/ro Shewaye Gordofa from Finance Department.

Finally, my appreciation extends to W/t Meskerem Tilahun for her secretarial work.

Thank you all!

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Abstract

Inventory Management is one of the most responsibilities of an operations manager. Insufficient inventories hamper production and limits sales, where as excessive inventories tie up cash that may be urgently needed elsewhere. It is no surprise, then, that inventory control has been the key to the success of many firms as well as the cause of failure of numerous others. (Monks,1989:392).

In view of the above, this paper is on 'Rubber Inventory Management'. The paper aimed at describing the existing rubber inventory management practice of Addis Tyre Share Company. For this purpose both primary and secondary sources of data were utilized. The primary sources of data were collected using interview. Due to its flexibility, the unstructured type of interview was employed. The research is expected to provide information at least on the proportion of the total capital invested in rubber inventory, the type of inventory control system employed, and the contribution of this system to operation efficiency.

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CHAPTER ONE
INTRODUCTION

The acquisition, production, and/or distribution of inventories are issues of concern to all organizations irrespective of type, size and nature. Keeping the materials in inventory ensures normal operations of any organization.

In to days changing environment, where change is the rule than the exception business organizations are constantly heading towards throat cut competition. Survival, leave alone success, in such circumstances relies heavily on exploiting internal strength and out side opportunities in an effective & efficient way and minimizing ones weakness & threats coming from out side.

One way of meeting the question of survival & consequently success is by way of employing sound inventory management system. One of the inventory items, raw materials, alone constitute a major recurring_investment in several companies & modern management is becoming increasingly conversant that it is possible for a firm to reduce capital tied up as a result of stocks maintained, without hampering the production and customer good will. This results in substantial reduction of the cost incurred for holding large size of inventory.

In Addis Tyre Company, S.C, more than 80 raw materials are stocked. However, no previous study with respect to the management of these raw material inventories was undertaken. Among these raw materials Rubber (natural & syntetic) is one of the major raw materials accounting for about 50 percent of the total composition of a Tyre.

1.1 Objective Of The Study

It is a hard fact that materials especially in manufacturing enterprises constitute substantial sum of the firms invested capital. As stated in the introduction, rubber accounts for about 50 percent of the materials required to make a Tyre. Thus the major objective of the study is to describe the rubber

inventory management practice of Addis Tyre Company,S.C. In this regard, the study tries to investigate the following:

- *How much rubber inventory did the Company stock: What proportion of the total capital is invested in rubber inventory?*
- *Does the Company acquire rubber periodically? Is there a known/fixed lot size? How frequently does the Company order?*
- *When is rubber ordered: When the rubber inventory is zero or when the rubber inventory reaches a certain level?*
- *How is rubber ordered: On a fixed time period, or On a fixed predetermined order quantity basis?*
- *What is the time elapsed between ordering rubber and receiving them?*
- *Does the Company give special attention to rubber inventories? Why?*
- *Is there a division in charge of the rubber inventory alone? What are its major tasks?*
- *What type of inventory control system is employed? Why?*
- *How important is rubber inventory in facilitating operations?*
- *Before placing a purchase order, does the Company exactly know the amount of rubber inventory on hand? If not how can the Company determine how much determine how much to order?*
- *Does the Company undertake physical inventory count? What are the procedures involved in undertaking physical inventory?*

1.2 Significance of the study

I believe that the result of this research would have the following significance or importance:

- It enables the researcher to be familiar with the practical aspect of inventory management.
- The possible recommendations that the researcher is likely to come up with will contribute positively to the company's rubber inventory management practice.
- It will provide insight to Addis Tyre as well as other Company's to pay attention to the proper management of their inventories.

1.3 Scope Of The Study

The study is confined only to the description of the rubber inventory management practice of Addis Tyre Company. No study is done on other inventory items.

1.4 Methods Of The Study

In order to properly describe the rubber inventory management practice of Addis Tyre Company, information with respect to lot size per order, frequency of purchase, ordering cost, carrying cost, totall investment in rubber, and other aspects of inventory are collected from the concerned officials. The amount of natural and synthetic rubber over five years period are also collected.

All the necessary data or information was collected through both primary and secondary methods of data collection. The primary source of data was gathered through a series of interviews with concerned officials. The unstructured type of interview was preferred for its flexibility. The secondary source of data was collected from company records & publications, and other sources like books and Internet websites just to strengthen the primary data collected.

For examining the rubber content of the company's Tyres', five tyres were selected based on their composition of natural and synthetic rubber.

For the proper presentation and description of the data collected tables & graphs are used.

1.5 Limitations Of The Study

In conducting the research time was the major constraining factor, the successive meetings that were conducted during the study time had greatly contributed to this. Lack of well-organized data has limited me not to compare the Company's order size with the order size that should prevail had the EOQ been applied presently.

CHAPTER TWO
REVIEW OF RELATED LITERATURES

2.1 DEFINITION OF INVENTORY AND THE CONCEPT OF INVENTORY MANAGEMENT

Inventory is the stock of any item or resource used in an organization.(Chase, Aquilano & Jacobs;1998:582).Inventories do not just constitute the storing of materials but may be viewed as the storing of resources such as labor and labor skills; machine and processing capacity, and overhead. The storing or "inventorying" of these resources allows management to decouple or make relatively independent the individual operations that make up the individual process. (Del Mar; 1985:262).

Inventory is working capital and therefore the control of inventories is an important aspect of operations management.(Chary;2000:136). Inventory management is among the most important operations management functions because inventory requires a great deal of capital and affects delivery of goods to customers. Inventory management has an impact on all business functions, particularly operations, marketing, and finance. Inventories provide customer service, which is of vital interest to marketing. Finance is concerned with the overall financial picture of the organization, including funds allocated to inventory. And operations need inventories to assure smooth and efficient production.

Inventory planning and control are the major components of inventory management. Inventory planning is the determination of the type and quantity of inventory items, which would be needed at future periods for maintaining the fleets or production schedules. Inventory planning is generally based on the information concerning the past usage and also on factors that are likely to crop up in the future. Once this sort of planning is done, the control process starts;

which means that actual and planned inventory position is compared and necessary action be taken if needed to assure that the component (or the inventory items) will be on hand when they are required.

2.2 TYPES OF INVENTORY

The different types of inventories and their peculiar characteristics can be noted as follows (Hendrick 163-165).

1. Raw material Inventories

Every manufacturing firm processes certain raw materials into finished products. Heavily used raw materials and purchased parts are usually purchased on blanket contracts with deliveries scheduled to match the organization's needs. Less used raw materials are usually controlled by dollar limits, time limits and other methods.

2. Work in process inventories

Controlling work in process is largely a matter of moving products through production as fast as possible, but it is also concerned with getting orders out in their proper priority orders.

3. Supplies:

They are supporting materials that are consumed in running the plant or in making the company's products but which do not go into the product. Some times they are called MROs (maintenance repair and operating supplies). While the cost of MROs over a year is usually low compared to that of material going to products, their control should not be neglected.

4. Finished goods inventories

Finished goods inventory consist of goods, which have been manufactured but not dispatched to dealer and consumers. Efficient management of these inventories for a firm results in saving of considerable amount of financial resources. R.D Agrawall (5^{th} ed. P.535) States that "Control of inventories is one of the prime concerns of management as they often represent as much as 40 percent of owner's investment and 20 percent of total assets"

Similarly Hendricks and Co-Authors state that during the early 1980s General Electric sold over $ 25 billion of products per year and at the end of a year owned over $ 4 billion inventories, stocks of materials and products. General Foods sold over $ 6 billion per year of products and ended with owning over $ 1 billion of inventories. In these companies inventories accounted for more than one fourth of all the companies invested capital.

2.3 PURPOSES OF INVENTORIES

All firms (including JIT operations) keep a supply of inventory for the following reasons. (Chase, Aquilano and Jacobs;1998:583-584).

1. ***To maintain Independent of operations***: A supply of materials at a work center allows that center flexibility in operations. For example, because there are costs for making each new production set up, this inventory allows management to reduce the number of set ups.

   Independence of workstations is desirable on assembly lines as well. The time that it takes to do identical operations will naturally vary from one unit to the next. Therefore, it is desirable to have a cushion of several parts within the workstation so that shorter performance times can compensate for longer performance. This way the average output can be fairly stable.
2. ***To meet variation in product demand***: If the demand for the product is known precisely, it may be possible (though not necessarily economical) to produce the product to exactly meet the demand. Usually, however, demand is not completely known, and a safety or buffer stock must be maintained to absorb variation.
3. ***To allow flexibility in production scheduling***: A stock of inventory relieves the pressure on production system to get the good output. This causes longer lead times, whichpermit production planning for smoother flow and lower cost operation through larger lot size production. High set up costs, for example, favor production of a larger number of units once the set up has been made.

4. ***To provide a safeguard for variation in raw material delivery time***: When material is ordered from a vender, delays can occur for a variety of reasons: a normal variation in shipping time, a shortage of material at the vendor's plant or at one of the shipping companies, a lost order, or a shipment of incorrect or defective materials.
5. ***To take advantage of economic purchase order size***. There are costs to place an order: labor, phone calls, typing, postage, and so on. Therefore, the larger the size of each order the fewer the number of orders that will be written. Also, shipping costs favor larger orders- the larger the shipment, the lower per unit cost.

2.4 INVENTORY COSTS

According to Chase, Aquilano and Jacobs (1998:584-585), in making any decision that affects inventory size, the following costs must be considered.

1. ***Holding (or Carrying) costs***: This broad category includes the costs for storage, facilities, handling, insurance, pilferage, breakage, obsolescence, depreciation, taxes, and the opportunity cost of capital. Obviously, high holding costs tend to favor low inventory levels and frequent replenishment.
2. ***Setup (or Production change)costs***: To make each different product involves obtaining the necessary materials, arranging specific equipment setups, filling out the required papers, appropriately charging time & materials, and moving out the previous stock of material.
   If there were no costs or loss of time in changing from one product to another, many small lots would be produced. This would reduce inventory levels, with a resulting savings in cost. One challenge today is to try to reduce these setup costs to permit smaller lot sizes. (This is the goal of JIT system)
3. ***Ordering costs***: These costs refer to the managerial and clerical costs to prepare the purchase or production order. Ordering costs include all the details, such as counting items and calculating order quantities. The costs

associated with maintaining the systems needed to track orders are also including ordering costs.

It is important to recognize that these are costs associated with the frequency of orders and not the quantities ordered. For the most part order cost is primarily the labor associated with processing the order however the company can include the other costs such as the costs of phone calls, faxes, postages, envelops, etc.

4. ***Shortage costs:*** When the stock of an item is depleted, an order for that item must either wait until the stock is replenished or be cancelled. There is a trade-off between carrying stock to satisfy demand and the costs resulting from stock out. This balance is sometimes difficult to obtain, because it may not be possible to estimate lost profits, the effects of lost customers, or lateness penalties. Frequently, the assumed shortage cost is little more than a guess, although it is usually possible to specify a range of such costs.

   Establishing the correct quantity to order from vendors or the size of lots submitted to the firm's productive facilities involves a search for the minimum total cost resulting from the combined effects of four individual costs: holding costs, setup costs, ordering costs, and shortage costs. Of course, the timing of these orders is a critical factor that may impact inventory cost.

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2.5 INVENTORY SYSTEMS

According to Levin, Rubin and Stinson, there are two basic inventory decisions managers must make as they attempt to accomplish the functions of inventory. These are

1. How much of an item to order when it is time for the inventory of that item to be replenished?
2. When to order the inventory of that item?

The decision rules guide the inventory manager or computerized materials management system in evaluating the current state of the inventory and deciding

if some action, such as replenishment is required. In inventory models the major objective consists of minimizing the total inventory cost and to balance the economies of large orders or large production runs against the cost of holding inventory and the cost of going short. (Internet; J. Colpeart, E. Omey)

Inventory models for calculating optimal order quantities and reorder points have been in existence long before the arrival of the computer. Accurate product costs, inventory costs, forecasts, history and lead times are crucial in making inventory models work. (Internet: Dave Piasecki)

Meredith and Shafer state that all inventory systems can be classified as one of three varieties based on the approach to deciding 'when to order",

1. *Reorder point systems*
2. *Periodic review systems*
3. *Materials requirements planning systems.*

Let us see each system one by one.

1. Reorder point systems:

Under these systems an inventory level is specified at which replenishment order for a fixed quantity of the inventory item is to be placed. At the time the inventory on hand reaches the predetermined inventory level (the reorder point) an order may be made for a pre specified amount provided that there are no current outstanding orders. This reorder point is established so that the inventory on hand at the time an order is placed is sufficient to meet demand during the lead-time. The quantity of inventory to be ordered is usually based on the economic order quantity (EOQ) approach, the basic "how much to order" model. This model is discussed on page 11.

2.Periodic Review Systems:

In these systems, the inventory level is reviewed at equal time intervals, and at each review a reorder may be placed to bring the order up to a desired quantity. The amount of the reorder is based on a maximum level established for each inventory item. The amount of inventory that should be ordered is the

amount required to bring the on-hand inventory plus the on-order quantity minus the expected demand over the lead-time to the maximum level.

Under the periodic review systems the review period is fixed, and the order quantity varies. This system is more appropriate when it is difficult to keep track of inventory levels and the cost of stock outs or safety stock is not excessive.

In contrast, in reorder systems the quantity ordered is fixed, and the reorder period varies. The reorder point system is best where a continuing watching of inventory levels is feasible and stock outs or safety stock would be expensive.

3. Materials Requirements Planning (MRP) Systems:

Reorder point and periodic review systems are appropriate for inventory items with fairly constant and independent demand; an independent demand means that a demand for one item is not dependent up on the demand for another item.

Dependent demand means that a demand for an item is affected by a demand by another item. Dependent demand items are components, assemblies and sub assemblies of the finished item. Therefore, MRP is a system designed specifically for the situation when lumps in demand are known about before hand, typically because the demands are dependent. MRP is a management system for production and inventory.

2.6 THE ECONOMIC ORDER QUANTITY (EOQ)

The basic economic order size model, introduced in 1915 is one of the most widely used decision models for independent demand ordering. The EOQ model assumes that (Stevenson p. 496.)

1. Annual demand is known, either through a forecast or because of customer order
2. Items will be withdrawn form inventory at a uniform rate
3. A constant order size, Q will be used
4. Unit cost is independent of order size. Hence quantity discount is not a consideration

5. Orders will be received in their entirety than piece meal
6. Replenishment lead times are known and constant
7. No shortages will be permitted

According to Stevenson (p. 497) the assumptions pertaining to EOQ are meant to meet the goals, which he states as follows

"The objective of EOQ analysis is to identify the order size that will minimize the sum of annual holding and ordering (replenishment) costs purchasing costs are not included in the analysis because they are the same regardless of an order size and shortage costs need not be considered because it is assumed shortage can be avoided."

An algebraic method of determining EOQ is based on the principle that the most economical point in terms of total cost is one where (the total cost) is the minimum possible and this happens when total inventory carrying cost is equal to the total ordering costs.

Annual holding cost is the product of average inventory Q and the cost for holding a unit of inventory for a year (H). Then annual holding cost equals = $\frac{Q}{2}$H

(holding cost increase linearly as Q increases)

Annual ordering cost is the product of stocking cost per order, S and the number of order per year. With annual demand = D and order size Q the number of order per year will be $\frac{D}{Q}$ and the annual stocking or ordering cost will be $\frac{D}{Q}s$

The total annual cost of holding and ordering inventory is the sum of these two costs:

TC= Annual holding cost + annual ordering cost

$$\frac{Q}{2}H + \frac{D}{Q}s$$

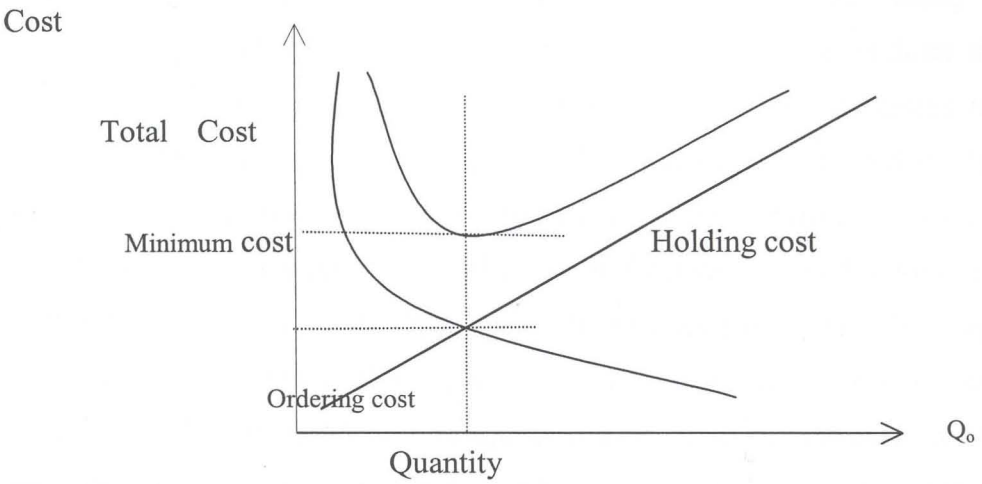
Where

D= annual demand
Q= Order quantity
H= Unit holding cost per year
S= Ordering cost for one order

The optimum order quantity Q is the order quantity at which the total cost curve is a minimum. Q is the quantity at which the ordering cost equals holding cost see the figure below.

The minimum occurs when $\frac{Q}{2}H = \frac{D}{Q}s$, solving for Q or the optimum quantity yields, the formula $Q_u = \sqrt{\frac{2DS}{H}}$

Figure: Optimal Order Quantity Point



The Economic order quantity, there fore, seeks to balance the ordering and the carrying costs to arrive at the optimum order quantity.

2.7 PARETO (ABC) ANALYSIS: (Downloaded From Internet)

Pareto analysis (a.k.a. ABC analysis or 80/20 rule) can be used to classify stock groups. Stock items are ranked in descending order of usage value, and plotted on a cumulative frequency curve. It is common to find that 20% of items account for 80 % of usage value; the next 30% has 15% of value. The final 50% have 5% of value. ABC or Pareto analysis points the way to where control efforts are best directed. Judgment is needed on critical inventory items or security matters that Pareto analysis in itself does not reveal.

2.8 JUST IN TIME (Internet: March/April 2002 issue of manufacturing today)

Reduce Inventory by Reducing Lead Time: *In the world of the lean, just-in-time (JIT) supply chain, inventory is the enemy. Leading companies are looking for new tools and techniques to remove excess inventory from their supply chains and off of their books. Yet, how can they reduce buffer stocks without jeopardizing service levels and vital sales revenue? By Sami Cassis*

Improve your execution of the replenishment process, and go after lead times. The first approach attacks inventory itself through crisp, rapid execution of inbound materials replenishment. The second attempts to reduce the "inertia "of the supply chain by reducing lead-time. Although most companies recognize and act upon the former, few realize the importance of the latter. The reason is simple: Most of us have been trained to accept lead-time as an immutable constraint in the supply chain. After all, if it takes a supplier four weeks to build some-thing, there is very little you can do about it, right? The arguments that follow will clearly dispel that notion. A primary reason companies carry inventory at all is to protect against a range of supply chain uncertainties, from shipping and execution glitches to unanticipated customer demand. The degree to which a firm is vulnerable to these risks –and the level of inventory that it must carry to meet them –is directly proportional to lead-time. The shorter the lead-time, the less overall uncertainty a company faces and the better it can respond to unanticipated events. Thus, reducing lead times allows a firm to dramatically slash the buffer inventory it must carry to protect its production goals, thereby dramatically improving operational efficiency.

In the inbound materials supply chain, lead-time can be broken down into three components: 1) order execution lead-time, 2) production lead-time and 3) transportation lead-time. Much of this time consists of the necessary steps needed to order, produce and ship material according to a manufacturer 's production needs. However, one of these three –order execution –can entail significant and unnecessary delays that lead to sluggish execution and excess inventories across the supply chain.

CHAPTER THREE

RUBBER INVENTORY MANAGEMENT PRACTICE OF ADDIS TYRE COMPANY,S.C.

3.1. Overview of the organization

Addis Tyre Company,S.C., a sole tyre manufacturer in Ethiopia , was officially inaugurated in October 1972 with a capacity of 60,000 tyres and 45,000 tubes per annum, in two shifts operation and with a total labor force of 260. It is located in Addis Ababa woreda 19 kebele 07 (Debrezeit Road) covering a total area of 69,158 square meters.

The company had been organized with a total of 500 shares (each of which Birr 100 worth) as a share company, earlier to its being operational, by five indigenous business organizations among which the Agricultural and Industry Development Bank (AIDB) was major share holder.

Immediately after production capacities were commenced a technological change and more capital was needed and hence, plus to some other action, YOKOHAMA RUBBER Company Ltd. (YRC) and MITSUBISHI together bought a 35% share and the share capital was introduced and further at later stage YRC and ATC entered into a separate Technical cooperation contract which is still in operation.

Because of the proclamations of socialism by the then Military regime in Ethiopia the interest of the two foreign stockholders diminished and eventually their Managerial participation weathered away. The government alone injected substantial amount of capital for the company and hence through time the total foreign companies' share reduced to 6%. Furthermore, the Ethiopian Government continued to run it alone with out

changing the legal status of the company and launched rehabilitation and expansion project with a cost amounting to Birr 250 Million.

Thus, the current capacity in three shifts operation is more than 28 M.T / or about 900 pieces of tyre per day. Its potential yearly turn over is about Birr 200 million, and employment is also nearly 900. Total capital as of Sene 1994 E.C is Birr 267.7 Million and paid up capital Birr 5.9. Million.

3.2. Types and sources of rubber

In coming up with its desired outputs, Addis Tyre Share Company uses more than 80 types of raw materials. Of these rubber is one of the major inputs accounting for about 50 percent of the total composition of a tyre.

Two types of rubber, namely natural rubber and synthetic rubber, are used in producing every tyre type. Different grades of these rubber types exist in the inventory control section of the company. Under the natural rubber category, there are four grades of natural type. These are: SLR -20 , SLR-50 ,RSS-4 , and RSS-5 . For the synthetic rubber, on the other hand , there are five grades of synthetic type: SBR -1500 ,SBR-1712, BR1220 , BR1441, and Butuyl rubber .

Both natural and synthetic rubber are imported form different sources .The natural rubber is imported from Asian countries like Malaysia and Sirlanka and the Synthetic rubber is imported from any petroleum predicting countries, such as south Africa, Italy, Belgium, and south Korea.

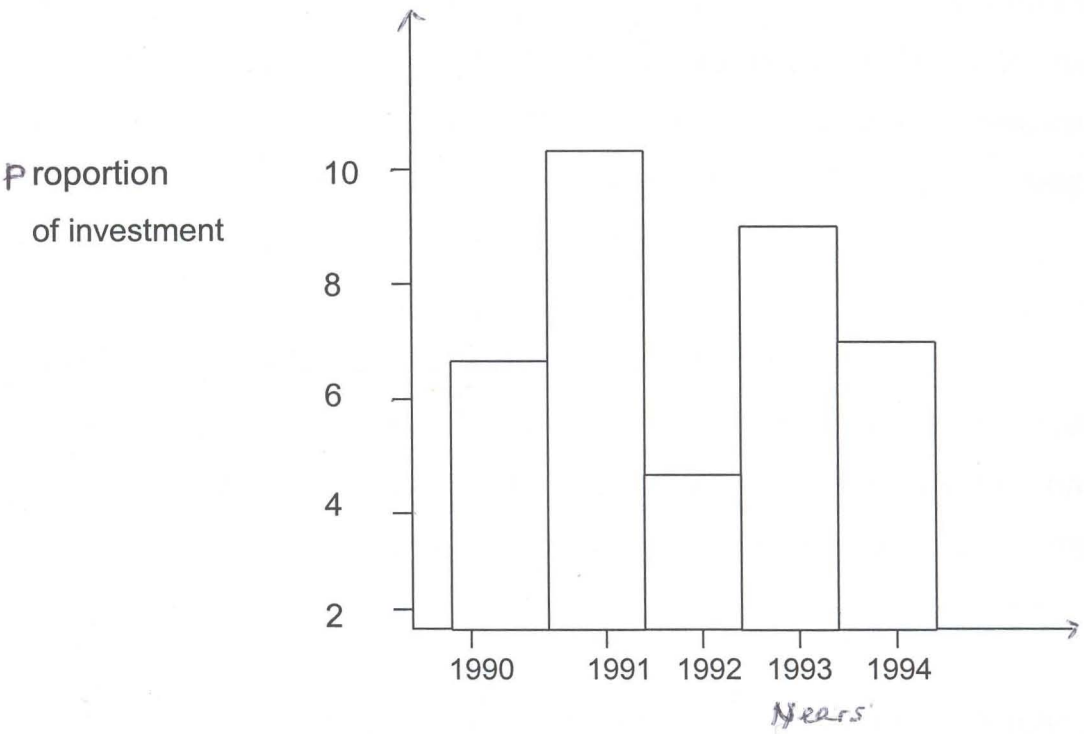
3.3 Proportion of rubber stock and total stock to total capital invested

In general, inventory or stock accounts for about 20 percent to 40 percent of the firm's total capital invested . For Addis Tyre Company, the proportion of rubber inventory (alone) and stock to total capital invested for the past five years (from years 1990 to 1994 E.C) are as given in the following table .

Year (E.C)	Rubber stock (in Birr)	Total stock (in Birr)	Total capital invested in Birr	Rubber stock to total capital	Total stock to total capital
1990	17,015,502.41	108,994,285.00	258,300,000.00	6.59%	42.20%
1991	20,971,430.00	89,416,465.15	207,642,792.74	10.10%	43.06%
1992	9,202,540.00	96,431,501.32	224,439,259,96	4.10%	42.97%
1993	21,778,053.00	106,580,941.00	244,849,071.00	8.89%	43.53%
1994	19,646,351.00	101,721,455.22	267,717,96149	7.34%	38.00%

From the above table we can summarize that over the past five years (i.e. since 1990) total stock accounts for about 38% to 44% of the total capital invested. Of these, rubber stock accounts for about 4% to 10% of the total investment of the company. Given the numerous raw materials and finished goods making the stock account a proportion of 4% t0 10% investment on rubber inventory alone is significant.

The following histogram can be used to clearly portray the investment of rubber inventory over the past five years.



3.4 The responsible unit for rubber inventory

In Addis Tyre Company the unit or division responsible for the management of rubber inventory and inventory in general is under the umbrella of the supplies department. In this department, there are three divisions:

- *The store division*
- *The purchasing division, and*
- *The inventory and property control division*

Among these three divisions the inventory and property control service is the primary responsible unit to the proper management of all inventories in the company, which are grouped in to four:

- *Row material inventory*

- *In transit goods inventory*
- *Finished goods inventory*
- *Prepaid supplies inventory (spare parts and stationery)*

For each the four classes of inventory, there are people assigned for their proper management. Rubber inventory (Natural and Synthetic rubbers) being on of the major raw materials of the company are kept and controlled under the raw materials inventory . There is no separate unit responsible for the control of rubber inventory alone.

3.5 The management of rubber inventory

Addis Tyre Company purchases rubber (Both natural and synthetic) four times in twelve working months. The quantity of order may vary each time an order is placed depending on the level of usage or consumption of inventory by the production department.

The amount of purchase and consumption of natural and synthetic rubbers (in Birr) for five years period (including 1995 projection) is given in the following table.

Time	**Natural Rubber**		**Synthetic rubber**	
	Purchase	***Consumption***	**Purchase**	***Consumption***
1991	8,001,209	10,211,307	6,303,109	5,110,917
1992	8,807,184	19,795,881	7,575,088	8,335,281
1993	34,905,583	23,173,958	10,985,565	10,141,677
1994	16,424,726	18,368,804	6,229,979	6,239,987
1995 (Projected)	7,549,633	15,146,414	2,307,604	4,522,691

In purchasing rubber the purchasing policy of the company requires that all grades of natural rubber (SMR-20 SMR-50, RSS-4 and RSS-5) should be supplied from one manufacturer and for synthetic rubber (SBR-1500, SBR,1712 , BR-1220 , and BR -1441) , two should be supplied from one supplier . But it is possible that all be supplied form one supplier.

In shipping the items from the suppliers, all of the one time orders (3 months quantity) may not be shipped at one time instead a partial shipment may be shipped three times. At this time the suppliers will be informed in advance the number of times an order is shipped.

The partial shipment strategy is deemed to free the space of storage for other materials and to reduce the risk associated with full shipment (such as sinking of a ship) and over stocking of inventory.

The amount of rubber in stock is reviewed every time a withdrawal from inventory or an addition to inventory is made based on the records from ledger. As a result before placing a purchase order, the responsible bodies know the amount of rubber inventory on hand.

The time elapsed between placing an order for rubber and receiving it, that is, the lead-time is seven months. With in the lead time three basic activities are performed: purchasing processing, L/P processing, and shipment follow up .

Considering the periodic review systems (or fixed time period model) and the reorder point systems (or fixed order quantity model) of inventory management systems, Addis Tyre company's inventory system seem to employ certain aspects of both systems.

3.6 Safety stock and the EOQ model

To buffer against uncertain demand, the Company maintains a safety stock of rubber that is sufficient for 1.5-month period consumption. This is for both natural and synthetic rubber, including other direct raw materials of the company. So, every purchasing activities of the direct raw materials of the company are scheduled in such a way that a new shipment arrives when the stock is down to 1.5 month consumption. Thus, the department initiates a purchase order when the stock on hand is sufficient to cover the lead-time and the safety stock.

The quantity of rubber purchased each time an order is placed varies depending on the amount of rubber on hand and the expected future consumption (the capacity of the machines operations). In determining how much and when to order the company is not applying the famous EOQ model. In the future, however, they do have a plan to implement/apply this model.

For the application of the EOQ model, the company has estimated the carrying cost to lie in between 10% to 25% of each individual item in inventory. The ordering cost, on the other hand, is projected to lie in between Br. 5,000 and Br. 7000 per order.

3.7 The ABC Inventory model application

It is a common practice to exercise varied degree of control over the different types of inventory items. Variation of the value of the inventory items or difference in the amount of money expended on them and variation in the very nature of the items demand varied degree of attention and management. The inventory items vary in terms of their holding cost, price, annual volume, etc and consequently these different inventory items do not possess equivalent importance to an organization. Small but expensive items may generate more profit and carry a higher loss if they are lost or damaged (deteriorated).

Hence the dollar amount allocated for control varies with the type of inventory depending on their importance. The inventory and property service division of Addis Tyre Company applies the A.B.C. approach of inventory control on the items that are in stock. For raw material inventories based on their rate of usage the A.B.C items account for about the following.

- ✓ A items account for about 71.69% of the total birr value of the inventory
- ✓ B items account for about 23% of the total Birr value of the inventory
- ✓ C items account for about 5.31% of the total Birr value of the inventory

Considering the A.B.C. approach of selective inventory control, all of the four categories of natural rubber (SLR-20, SLR-50, RRS-4 and RRS-5) are " A" item inventories. Form the synthetic rubber category, on the other hand SBR-1500, SBR 1712 and Butyl rubber are " A" item inventories where as BR-1220 and BR-1441 are B item inventories

3.8 Physical inventory count

Though a review of rubber inventory is made each time an addition or withdrawal of inventory is made, the company conducts a physical inventory count. This physical count is conducted through a periodic inventory count and a surprise inventory count.

The company conducts periodic inventory count (closed count) one times a year, at the end of the fiscal year. For making a periodic count the following procedures are involved.

1) Notifying and orienting the people involving in the physical count. (Three people are involved of which two are the counters)
2) Arranging a program for the physical count

3) Following up whether the physical count is conducted as per the program

In the periodic count the task of the storekeeper is only to make the items ready for count. He / she will not disclose the quantity of the items in stock to the assigned physical counters.

After the periodic count is completed, people not involved in the physical count will make comparison of the quantity of items in inventory and the record of the items counted. If there is a deviation, the responsible body will be first requested to give suggestions. Then, it will be passed for decisions.

The purpose of periodic inventory count is to report missing/damaged items for a timely management action and to match the appropriate quantity on hand with inventory management system. Besides these, it is aimed at knowing exactly the amount of inventory on hand for the preparation of the financial statements, to determine the net income / net loss of the fiscal period.

In addition to the periodic count, surprise inventory count is conducted. A surprise inventory count may be carried out two or three times a year. It focuses on items of high value (like rubber) and is aimed at checking whether the items are placed in their appropriate place.

3.9 Rubber content of sample tyres

Addis Tyre Company produces different types of tyres each differing in size and /or raw material composition but each of the different tyres pass through the same production flow as shown in the diagram of the following page.

The composition of both natural and synthetic rubber for one tyre through out the whole production flow remains the same, the amount added / mixed at the compound preparation phase.

The amount of rubber content for a sample of five tyres, which are of the same size : 1200-20 , is given in the accompanying table.

TYRE TYPE	WEIGHT OF NATURAL RUBBER (IN KG)	WEIGHT OF SYNTHETIC RUBBER (IN KG)
AT-30	26.375	4.213
AT-20	25.917	4,213
At-10	30.360	4.213
AT-NB-72	31.756	4.213
NB-27/32	28.585	4,213

CHAPTER IV

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

4.1. Summary and conclusions

Inventory is the stock of any item or resource used in an organization. Though its share in the market varies depending on the nature of business the firm carries on, investment is a investment item. However, most organizations show little concern to its inventory management. Disproportionate level of attention is attached to it as compared to the amount of money placed on it.

Inventory management, however, has been the key to success of many firms and the cause of failure of numerous others. Insufficient inventories hamper production and fail to generate adequate sales, whereas excessive inventories adversely affect the firm's cash flows and liquidity position. From either perspective, poor inventory management present a serious challenge to the viability of an organization and can have a disastrous effect on its solvency.

The problems of inventory management can not simply be ignored in the hope that they will go away neither can one relies on intuitive methods of establishing order quantities and setting inventory stock levels . The competitive business world and responsible public administrator will simply not permit this. Someone must intelligently set policies, establish guidelines for inventory levels, and insure that appropriate control systems are functioning properly .

When we evaluate the rubber inventory management practice of Addis Tyre Company, the company keeps a record system which reviews the

amount of rubber in stock every time an addition to inventory or a withdrawal from inventory is made . By considering the fact that all items in inventory do not possess equal value, the company has also adopted the A.B.C inventory control system for rubber as well as for other raw materials.

In addition, a periodic and surprise counts of inventory is conducted to check for the proper handling of materials and whether their is deviation to report on missing / damaged items and to determine the right quantity on hand. The company is also on the way to introduce scientific techniques such as EOQ, which is useful in deciding when and how much to order.

In order to safeguard against stock outs, a safety stock for 1.5 month consumption is maintained and a partial shipment of rubber is adopted to minimize the risk associated with full shipment.

In general, all of the above explanations magnify the company's strong rubber inventory management practice. And hence it is possible to conclude that the company is doing good in managing its rubber inventories. However, it would more even be better , if the company materializes the application of the EOQ model .

4.2. Recommendations

Based on all what I have observed from the rubber inventory management practice of the company I forwarded the following as recommendations for the further improvement of the company's rubber inventory management.

☞*The person in charge of managing the company's rubber and other row material inventory is devoted and eager to apply better means of managing*

inventory. So, it would advisable if the company's higher officials devise a means to encourage his effort and commitment.

- *The company will be better of if it minimizes the investment in safety stock by evaluating the stock out cost with the cost of maintaining safety stock. This may probably be enhanced if it reduces the lead-time.*
- *The use of the A-B-C inventory control system, the instantaneous updating of rubber inventories based on the ledger records, the periodic and surprise inventory counts, and the partial shipment strategy of rubber should be encourages to continue in the future. Further more, the company should pursue with the materialization of the EOQ model.*
- *The quantity or rubber to be purchased and stocked is a function of the company's production forecasts. Thus, the production department should realize production forecasts to avoid/ minimize capital tie-ups and stock outs.*
- *The finance department has to maintain records and should keep higher officials informed periodically about the amount of capital tie-ups in inventory so that they can make optimal decisions concerning inventory policies.*

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