

# MATERIALS MANAGEMENT IN STATE TRANSPORT UNDERTAKINGS IN INDIA WITH SPECIAL REFERENCE TO KERALA STATE ROAD TRANSPORT CORPORATION

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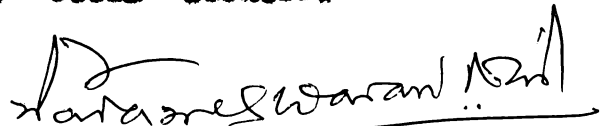
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A thesis submitted to the University of Cochin in partial  
fulfilment of the requirements for the award of the degree of  
DOCTOR OF PHILOSOPHY IN MANAGEMENT under the  
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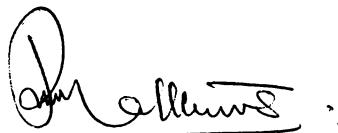
## CERTIFICATE

I certify that the thesis entitled " Materials management in state transport undertakings in India, with special reference to Kerala State Road Transport Corporation " submitted by Shri P.V. Mathew is the record of bonafide research carried out by him under my supervision and guidance. I also certify that the thesis is suitable for submission for the award of the Degree of Doctor of Philosophy in Management, under the Faculty of Social Sciences.

  
Prof. (Dr.) N. Parameswaran Nair,  
Director,  
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## CERTIFICATE

This is to certify that the Ph.D thesis entitled " Materials management in state transport undertakings in India, with special reference to Kerala State Road Transport Corporation " is my original work based on the study conducted by me and that it has not previously formed the basis for the award of any degree, diploma, associateship, fellowship, or other similar title.



**P.V. Mathew**

## P R E F A C E

Cost of materials accounts for a major share of the total cost in a large number of manufacturing and service organisations. A large amount of capital is also tied up in the form of materials inventory. Hence control of the consumption and stocking of materials is of critical importance for improving the productivity and profitability in most of the enterprises. In order to exercise effective control over materials, the related functions of materials planning, purchasing, transporting, store-keeping and inventory control must be properly coordinated and brought into focus. This has led to the development of the integrated concept of materials management.

Scientific studies on the materials management systems and practices actually followed in various organisations in India are rather limited. This is particularly true with respect to service industries. In this context, the present study on the " Materials management in state transport undertakings in India, with special reference to Kerala State Road Transport Corporation " assumes particular significance. This study

examines, critically, the prevailing set up, procedures and practices of materials management in the Kerala State Road Transport Corporation ( KSRTC ) and compares them with the prevailing practices in other similar state transport undertakings. It indicates several areas for improvement with respect to the organisation, materials planning, purchasing, store-keeping and other aspects. It also seeks to develop a comprehensive inventory control system for KSRTC.

While completing this study, I wish to express my sincere thanks to the various persons who have helped and guided me in this work. The first and foremost among them is my teacher and guide Prof. (Dr.) N. Parameswaran Nair, M.A., M.B.A. ( Columbia ), Ph.D., Director, School of Management, University of Cochin. It is with a deep sense of respect and gratitude that I acknowledge the valuable help and guidance given by him at every stage of this study. It was primarily due to his inspiration that I took up this study on state transport undertakings with particular reference to Kerala. He went through the entire draft of the thesis, painstakingly, and offered several suggestions for improving its style, presentation and content.

I am greatly indebted to my teacher Prof.(Dr)M.V.Pylee, M.A., D.Litt., LL.M ( Harvard ), former Vice Chancellor, University of Cochin, who was always a source of inspiration and guidance to me. He guided me rightly into the teaching career, as a member of his own faculty in the School of Management, University of Cochin. He has been evincing keen interest in my research work and in my career as well.

My sincere thanks are due to all my teachers and ex-colleagues at the School of Management, University of Cochin for their assistance and support on many occasions. I am particularly grateful to Dr. K.C. Sankaranarayanan, M.A., Ph.D., Professor and Head of the department of Applied Economics, University of Cochin. He went through the draft thesis and gave several suggestions for improvement.

This study would not have been possible without the assistance and cooperation from the General Manager and his team of officers of KSRIC, who found some time from their normally busy work schedule, to discuss with me various aspects of management in the KSRIC. My special thanks are

due to Mr. Nirmalan Thampi, Joint General Manager, Mr. Balachandran Nair, Controller of Purchase and Stores, and other Officers, especially Messrs. Gopalakrishnan Nair, Jacob Paulose, Venngopal, Rajan, Wilson Thapas and Ramarajan Nair. I am grateful to the various general managers and purchase/stores controllers in other state transport undertakings in the country, who responded to my mailed questionnaire survey.

The study relied heavily on published materials regarding the performance, operational statistics and practices of materials management in the various state transport undertakings. This was made possible with the kind cooperation and assistance of the faculty members and library staff at the Central Institute of Road Transport, Pune. I am particularly thankful to Dr. P.V. Kulkarni, Deputy Director ( Management Studies ) for his valuable help and encouragement.

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**CHAPTER - I**

**MATERIALS MANAGEMENT FUNCTION**

The management of any organisation is essentially concerned with the efficient and effective utilisation of its resources.<sup>1</sup> The various resources of an enterprise such as men, machines, materials, facilities etc., are planned, organised, directed and controlled by the management in order to produce goods and services. The resources are the inputs and the goods and services are the outputs. The ratio between output and input is termed productivity.

Productivity indicates the efficiency with which the various resources are utilised by an organisation. According to Peter Drucker, "A productivity measurement is the best yardstick for comparing managements of different enterprises.... Productivity is the first test of management's competence"<sup>2</sup>. The aim of management is always to improve productivity. Higher productivity means that more is produced with the same expenditure of resources or alternatively that the same amount is produced at less cost in terms of building space, machine time, labour or materials used up, thus releasing some of these resources for the production of other goods and services.

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1 Efficiency relates to the process whereas effectiveness relates to the results or the output of an action. For further discussion of these concepts, see William J. Reddin, Managerial Effectiveness, New York, McGraw Hill, 1970, pp.3-8.

2 Peter F. Drucker, Management: Tasks, Responsibilities, Practices, New Delhi, Allied Publishers, 1975, p. 111.

### Importance of materials control

The importance of the various resources for productivity improvement depends mainly on their relative share in the cost of the final product or services. The cost structure may vary according to the nature of the enterprise, type of products and services, process or technology employed and the availability of the resources. However, it is generally observed that in a large number of industries and manufacturing operations, cost of raw materials, parts and other supplies accounts for more than 50 per cent of the cost of production. Even in most of the other industries where material costs are relatively less, it may still be the single largest single component of the total cost.

Analysis of the data relating to the industrial enterprises financed by ICICI in 1978-79 showed that material cost, on average, accounted for 67 per cent of the cost of production in these companies. The percentage for different industry groups varied from 36 per cent for ceramics to 83 per cent for cables. It was further observed that these companies, on the average, spent 59 per cent of their sales income on materials. Some companies spent considerably more than this. Material costs absorbed approximately 70 per cent of sales income in Cables, Rubber Products and Wire Ropes



industry. The details of the analysis are given in Table 1.1

**Table 1.1**

**Material Cost and Inventories in  
Selected Industries in India**

Sr. No.	Industry	No. of Companies	Material cost as % of cost of production	Material cost as percent of sales	Inventories as percent of total assets	Inventories as percent of current assets
1	Cables	7	83	73	36	49
2	Rubber products	10	78	69	32	43
3	Wire Ropes	4	77	69	28	43
4	Automobiles	8	77	68	43	63
5	Electrical Equipments	39	72	63	38	49
6	Food Products	9	72	65	47	66
7	Pharmaceuticals	8	69	54	38	50
8	Dry Cells	3	69	58	40	67
9	Textile Machinery	6	69	60	34	42
10	Bearings	5	68	53	45	67
11	Fertilizers	5	68	58	23	33
12	Steel Forgings	3	65	57	32	55
13	Textiles	41	65	59	38	56
14	Paper and Paper Products	20	59	51	22	46
15	Cement	7	45	41	23	47
16	Ceramics	5	35	27	24	39
<b>Weighted Average Value</b>			<b>67</b>	<b>59</b>	<b>35</b>	<b>51</b>

Source : Estimated from the statistics given in the Financial Performance of Companies - I (CICI Portfolio 1978-79), Bombay, The Industrial Credit and Investment Corporation of India, 1980.

Under these circumstances, the productivity of materials becomes a key factor in enhancing the profitability of most of the industrial enterprises. Because of its major share in the cost structure, even slight changes in material costs will exert great influence on a firm's profit picture. Suppose, for example, that a company has a sales income of Rs. 100 lakhs, spends about Rs. 60 lakhs on materials and earns a profit of Rs. 6 lakhs. A two per cent or Rs. 1.2 lakhs reduction in this Rs. 60 lakhs material cost will result in a profit increase of Rs. 1,20,000 - an increase of 20 per cent. To achieve this same increase through additional sales, the firm would have to boost sales by Rs. 20 lakhs. This indicates the tremendous potential of purchasing and materials control in increasing enterprise profits.

Efficient management of materials can also reduce the capital employed in an enterprise. The Return on Capital Employed ( ROCE ) is generally regarded as an overall measure of the profitability of an industrial organisations.

This is expressed as follows :-

$$ROCE = \frac{\text{Profit}}{\text{Capital Employed}}$$

The capital employed in an enterprise is the value of total tangible assets which comprises of net fixed assets and

current assets.<sup>3</sup> The analysis of selected Indian Companies, referred to above ( ICICI Portfolio 1978-79 ) and given in Table 1.1 showed that on average, inventories constituted 35 per cent of total tangible assets and more than 50 per cent of current assets.<sup>4</sup> Hence the level of inventories influences the size of capital employed in a company to a large extent and thereby the ratio of return on capital employed.

The value of ROCE can be increased by reducing the capital employed or by increasing the profit or by both. Efficient management of materials can simultaneously achieve both by increasing profits through reduction in materials cost and at the same time keeping optimum inventory levels without sacrificing the service requirements.

### Historical Aspects

Because of the magnitude of the expenditures required in acquiring and controlling materials and their resultant leverage on the profitability, companies devote a great deal of attention to the efficiency of their materials management operations. A brief look at the historical evolution of the materials function is necessary in order to understand the

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3 For further discussion on this ratio, see James C. Van Horne, Fundamentals of Financial Management, New Delhi, Prentice-Hall of India, Third Edition, 1978, p.43 and John J. Hampton, Financial Decision-making, New Delhi, Prentice Hall of India, 1977, pp. 101-102.

4 See Table 1.1. D.3

current situation. The evolution has been gradual and followed the growth of purchasing, store-keeping and inventory control functions.

At the initial stages when business organisations were rather small, the owners controlled all purchasing, one of the many functions they performed. However, as companies grew in size, the purchasing function was often assigned to the production department since it consumed most of the purchased materials. The production foreman bought all the materials, hired, fixed and promoted employees, scheduled production and handled individually almost all of the other aspects of production. Inventory control meant having a lot of materials on hand for use as and when required.

As the size and complexity of industrial activity increased and with the advent of Scientific Management Movement many of the activities performed by the foreman were gradually taken over by specialists. Among these was the purchasing function. It was found that by transferring purchasing to a specialist, the firm could usually obtain greater economies in purchasing. A trained buyer who was familiar with the details of a large number of supplies could usually do a better job than a foreman who had many other duties to discharge.

Before the turn of the century there were only a limited instances of purchasing departments, separate and distinct from production or other operating departments. Such purchasing departments were found mostly in American railroad companies. The first book, specifically dealing with the purchasing function was published in 1887.<sup>5</sup> The fact that the earliest writings on the purchasing function were on railroad purchasing can be explained by the predominance of railroad organisations in the economy of U.S.A. at this period, in which most of the early developments in management took place.

There were only very few organisations with separate purchase departments before the First World War. The war focussed attention on the importance of purchasing. As a result, a number of government departments and industrial organisations in the industrially advanced countries felt the need for having special departments to take care of purchases. In India, Sir James Scott Pitheathly, who was the Head of the Munitions Board during World War I, established the Indian Stores Department in 1922 and became the Chief Controller of Stores.<sup>6</sup> This Department was the predecessor to the present

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5 Marshall M. Kirkman, The Handling of Railway Supplies - Their Purchase and Disposition, Chicago, Chas. M. Trivess, 1887, 223 pp.

6 A.R. Palit, Outlines of Materials Management, Bombay, Academic Books Limited, 1970, p.24.

office of the Director General of Supplies and Disposals. The Indian Railways also had a separate stores organisation. Amongst the industrial organisations, the Tata Iron and Steel Company Limited, Jamshedpur was the first to establish a Central Purchase Department.<sup>7</sup>

The changes in manufacturing operations with companies becoming more specialised in their product lines, procuring most of the components for their products from outside steadily increased the rupee value of the materials purchased. Purchasing function became more complex, dealing with a large number of suppliers for the purchase of a wide variety of raw materials, components and subassembly units. The scope of purchasing widened over the years from being a mere order placing activity. Purchasing agents were increasingly required to forecast their material requirements, schedule the purchases and develop and maintain adequate number of competent suppliers so as to ensure the availability of the right quality material at the right time.

The application of systematic quantitative methods to the solution of inventory problems also began with the advent of Scientific Management Movement. The earliest known

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<sup>7</sup> Ibid., p.25.

analysis of an inventory system was by Ford Harris of the Westinghouse Corporation, U.S.A. who, in 1915, formulated and optimised a simple inventory model which resulted in the well-known economic lot size formula. This model has been modified and extended by many individuals since then. This formula is often referred to as the Wilson formula since it was also derived by R.H. Wilson independently as an integral part of the inventory control scheme which he developed. Benjamin Cooper in 1926 and Thornton C. Fry in 1928 extended the model to take care of finite production rate and risk in demand rate respectively. The first attempt to deal with a large variety of inventory systems and to present the beginning of a theory of inventory systems was made by Fairfield E. Raymond in 1931.

Development of the various Operations Research ( O.R. ) techniques during and after the Second World War accelerated the quantitative analysis of inventory problems. The publication of the paper " Optimal Inventory Policy " by Arrow, Harris, and Marschak in 1951 marks the beginning of what may

8 F.W. Harris, Operations and Cost ( Factory Management Series ), Chicago, A.W. Shaw Co., 1915, pp.48-52.

9 Elizer Nadler, Inventory Systems, New York, John Wiley & Sons, 1966, p.16.

10 F.E. Raymond, Quantity and Economy in Manufacture, New York, Mc Graw Hill, 1931.

be called the modern analysis of inventory systems.<sup>11</sup> Since then inventory management has been studied in considerable depth. Some authors even claim that "More O.K. has been directed towards inventory control than toward any other problem area in business and industry."<sup>12</sup>

### Materials Management

Although purchasing, inventory control and other related materials functions were assuming greater importance in industries, the need for proper coordination among these activities was not recognised until after the Second World War. The War added the concepts of coordination and interrelationship of the varied functions. Realising the benefits of this approach, industries gradually started unifying and coordinating the different functions in the materials field. By the end of the fifties, the concept of coordinated administration of the materials functions was well-established and materials management developed into a major corporate activity.<sup>13</sup>

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- 11 Kenneth J. Arrow, Theodore Harris, and Jacob Marschak, "Optimal Inventory Policy", Econometrica, Vol. 19, No. 3, July 1951, pp. 250-272.
- 12 C. West Churchman, Russell L. Ackoff, and E. Leonard Ahnoff, Introduction to Operations Research, New York, John Wiley & Sons, 1957, p.195.
- 13 Robert B. Ballot, Materials Management - A Results Approach, New York, American Management Association, 1971, p.6.



Materials Management is essentially an organisational concept that brings together under one organisational component, the Materials Manager, the responsibility for planning, purchasing, transporting, storing and controlling materials. He is on the same level as the Production Manager or the Marketing Manager and reports to the Chief Executive. This integration of materials functions under a single professional manager allows the company to take advantage of cost and inventory reduction and performance improvement opportunities unavailable if these functions were scattered under different departments.

The term "Materials Management" is synonymous with "Supply Management" as used by government departments or "Logistics Management" as used by the Military. The Greek word "Technomatics" defined as the "science of managing material flow" also indicates more or less the same concept.<sup>14</sup>

#### Scope of Materials Management

Materials management can be defined as the function responsible for the coordination of planning, purchasing, moving, storing and controlling materials in an optimum manner so as to provide customer service in line with

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<sup>14</sup> Richard A. Johnson, Fremont K. Kast and James E. Rosenzweig, The Theory and Management of Systems, New York, McGraw Hill 1963. p. 137.

organisational goals.<sup>15</sup> Contrary to what many managers believe, materials management is a lot more than purchasing or inventory control. Materials management is concerned with all activities necessary to provide an uninterrupted flow of materials, parts and services used in production.<sup>16</sup> It is concerned with all the activities involved in the acquisition, storage, flow and control of all materials directly and indirectly employed in producing goods or providing services. Many of the writers on materials management in India also subscribe to this view.<sup>17</sup>

From the above definition it is possible to identify the major functions of materials management. They can be broadly termed as follows.

### 1. Materials Planning and Control

This involves forecasting the material requirements, prices and rates and inventory levels, preparing materials budgets, scheduling the orders and monitoring the performance in relation to production and sales.

- 15 Robert B. Ballot, Op.cit. p.6. See also P.Gopalakrishnan and M. Sundaresan, Materials Management : An Integrated Approach, New Delhi, Prentice Hall of India, 1979, p.7.
- 16 Dean S. Ammer, "Why some PA's Don't Reach the Top", Purchasing Magazine, February 2, 1959, p.57. See also Dean S. Ammer, "Materials Management as a Profit Centre", Harvard Business Review, January-February 1969, and Leonard J. Garret and Milton Silver, Production Management Analysis, New York, Harcourt Brace Jovanovich Inc., 1973, Second Edition, pp. 357-358.
- 17 See A.R. Palit, op.cit. pp. 7-8, P.R. Gokarn, Essentials of Materials Management, Bombay, Samsiya Publications, 1970, pp.2-5 and P.Gopalakrishnan & M.Sundaresan, op.cit. p.7.

## **2. Purchasing**

This involves selection of sources of supply, finalisation of terms of purchase, placement of purchase orders, follow up, approval of payments to suppliers, evaluating the performance of suppliers and developing new sources of supply.

## **3. Storage**

This includes stocking and physical control of materials, receiving and issuing materials, stock verification, maintenance of stock records, codification, standardisation and disposal of scrap and surplus materials.

## **4. Inventory Control**

This involves fixing order quantities, setting inventory levels and safety stock levels, designing and installing inventory control systems, selective control of inventories and analysis and control of lead time.

Besides the specific functions mentioned above there are other functions like transportation, quality control of incoming materials, materials handling, etc, which are also generally considered to be falling under the purview of materials management. However, there is no common agreement among practitioners and academicians regarding what functions

should be included under the unified direction of the materials manager. The above discussion on the definition and scope of materials management assumes that the responsibility of the materials manager ends when purchased materials and supplies are delivered to the user departments.

A still broader approach is to consider materials management as a regulator of the flow of materials from suppliers through the various manufacturing departments and distribution channels to the hands of customers.<sup>18</sup> Proponents of this view hold that purchasing production and distribution are not separate activities but three aspects of the one basic task of controlling the flow of materials. In this structure, the materials manager not only is responsible for purchased materials but also is directly involved in manufacturing and marketing management. He is responsible for planning, scheduling and controlling production as well as for storing and distributing finished goods in addition to the functions mentioned earlier.

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18 See J.H. Westing, I.V. Fine and Gary Joseph Zeng, Purchasing Management, New York, John Wiley & Sons, 1969, p.36, Wilbur B. England and Michiel R. Leenders, Purchasing and Materials Management, Bombay, Taraporevala Sons & Co., 1978, pp. 64-68 and Robert B. Ballot op.cit. pp. 29-32.

The absence of a single unanimous approach to materials management is reflected in practice also by the considerable variations in the functions assigned to materials managers in several organisations. While commenting on the materials management practices in U.S.A. Victor H. Pooler, Jr. observes:

Yet some companies with a materials manager place only purchasing and inventory control under his direction....some have a materials manager who is a "super" purchasing man (presumably with a higher grade title); others have a "purchasing" department which encompasses all the functions in a full materials set up; and, finally, several large companies have divisions with a materials management organisation and divisions with a traditional purchasing group. 19

The nature of business, the number and variety of products manufactured, the structure of management, the relative strength and influence of different managers in the organisation and various other factors determine the precise area of control exercised by a materials manager in an enterprise. However, materials planning and control, purchasing, storage, inventory control, transportation of incoming materials and the disposal of scrap and surplus are integrated in most of the organisations that have adopted an integrated approach to materials management.

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19 Victor H. Pooler, Jr., The Purchasing Man and his job, Bombay, Taraporevala Publishing Industries, 1977, p.241.

The Japan Materials Management Association also endorsed more or less the same approach in its Report on Materials Management in Japan, 1960. It recommends that materials planning and programming, purchase and inventory and stores control must be included under the materials department whereas production planning and control must be under the manufacturing department.<sup>20</sup>

However, the General Electric Company of U.S.A., one of the pioneers in the field of materials management included production control function also under the unified direction of a materials manager. This was done because the planning and scheduling of internal operations primarily depend upon the fluctuating supply position of the large number of components they were buying from subcontractors.<sup>21</sup> It is pointed out that several other organisations have also included production control under materials management, principally where the manufacturing operation is of short cycle and relatively simple so that the "value added" is comparatively small.<sup>22</sup>

Under the circumstances it is difficult to concede that production planning and control should form a part of materials

20 A.R. Palit, *Op.cit.* p.27.

21 P.R. Gokarn, *Op.cit.* p.3.

22 Garrett and Silver, *Op.cit.* p.358.

management as a general rule. It can be further argued that production planning and control is integrally allied to production and if the materials manager undertakes this function, he could become so engrossed with highly complex production planning and scheduling system that he might not be as concerned with material costs as with getting the goods on time. It is precisely for this reason that purchasing and other materials functions were divorced from production. Centralisation of authority for all materials related functions ( including production planning and control and distribution of finished goods ) with the materials manager may also lead to frequent conflicts with the production and marketing departments.

Hence, in order to minimise interdepartmental conflicts and to facilitate smooth and effective functioning, it is desirable to demarcate the areas of responsibility among materials, production and marketing departments as follows.

- Materials Management** - Upto the point where materials are delivered to the manufacturing or other consuming sections.
- Production Management** - Upto to the point where manufacturing of the final products for sale is complete.
- Marketing Management** - From completion of manufacturing to receipt by customer and after

This only a general framework. Modifications may be required depending upon the demands of a particular situation. Production control remains with production department and the materials manager's responsibility is to conform to the schedules of dates when raw materials, subassemblies and components of the right type are required. Although control of finished goods inventory is the responsibility of the marketing manager, some times, it may have to be entrusted with the materials manager to take advantage of his special skills in inventory management.

#### Materials Management as a sub-system

A system may be defined as an interconnected complex of functionally related components designed to achieve a predetermined objective. Thus a system may have many components or elements such as materials, information, machines, people etc., which are organised or coordinated in some fashion to achieve a common purpose.

A business organisation can be considered as a system having several mutually interrelated elements. These elements of the system comprise the individual, the informal organisation, the formal organisation and the environmental systems which



have direct impact upon the business organisation. Production, marketing and finance functions are the traditional subsystems of an industrial organisation. With the regrouping the integration of all materials related functions, materials management has also emerged more recently as an important subsystem of the total organisation.

These subsystems constantly interact with each other and are mutually interdependent. Any change in the actions and policies of anyone of these functions will have repercussions in other functional areas also. For instance, if changes in production plans and schedules are not conveyed to the materials management department, they may not be able to procure the materials in time at economical prices and consequently production and marketing plans will be affected. In the same manner if the finance department is not informed about material purchase schedules and funds requirements in advance, prompt payment of bills will not be possible resulting in strained relations with suppliers, creating problems for future purchases. Further, delivery promises made to customers by marketing men must reflect the planned availability of purchased items, and the magnitude and diversity of these purchases are determined to a large extent

by the customer's demand for quantities and types of products as measured by the marketing departments. Hence it has to be recognised that overemphasis on the objectives and achievements of individual subsystems may lead to conflicts among these several subsystems and ultimately result in a net loss for the total organisation. The interdepartmental conflicts can be minimised by mutual trust and proper coordination among the departments. Establishing for each department clear performance goals related to the total organisational objectives will help to resolve the conflicts and improve the organisational performance.<sup>24</sup>

### Objectives of Materials Management

It follows from the above discussion that the objectives of materials management are derived from the total organisational objectives. Organisations normally specify

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<sup>24</sup> Richard I. Levin, et al. suggest four conditions for resolving organisational conflicts. They are i) state explicitly the decision rules under which the system is normally expected to operate; (ii) set the conditions under which exceptions are permitted; (iii) provide a mechanism for determining the trade off required; and insure that no system component is economically or organisationally penalised for being involved in a trade off. See Richard I. Levin, Curtis P. McLaughlin, Rudolf P. Lamone and John F. Kottas, Production/Operations Management, New Delhi, Tata McGraw-Hill, 1972, p.72.

objectives on several areas of its performance. According to Peter Drucker, "Objectives are needed in every area where performance and results directly and vitally affect the survival and prosperity of the business?"<sup>25</sup> These objectives must be verifiable, realistic and result oriented.

Some of the important organisational objectives are :

1. To achieve a specific return on investment
2. To earn a specific net profit
3. To achieve a definite sales target
4. To achieve a specific growth rate in sales or profit
5. To attain a specified level of capacity utilisation
6. To improve service to customers

In order to achieve these objectives, each department or functional area must indicate its contribution by clearly specifying and then attaining the individual departmental objectives.<sup>26</sup>

The major objectives of materials management must include :

1. High inventory turnover
2. Reduced cost of materials
3. Low rejection rates
4. Improved service levels
5. Improved supplier relations
6. Low departmental costs

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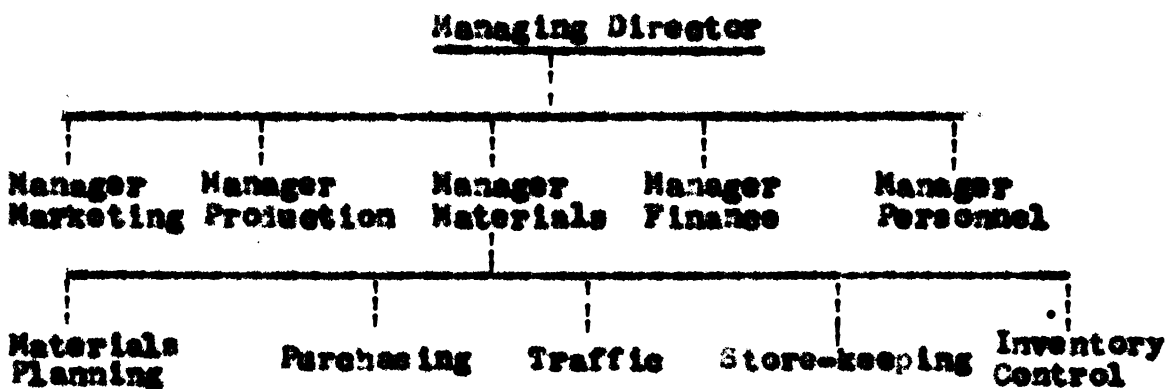
<sup>25</sup> Peter F. Drucker, The Practice of Management, London, Pan Books Ltd., 1969, p.83.

<sup>26</sup> Gary J. Zenz, "Evaluating Materials Management", Journal of Purchasing and Materials Management, (New York), Summer 1980, Vol. 16, Number 2, pp.18-21 Several verifiable objectives for the various functions of materials management are listed in this article.

These and other objectives must be clearly specified, realistic targets for future time periods must be set and the performance must be periodically reviewed to ensure their attainment. The concepts and process of Management By Objectives can be made extremely useful here.

### Materials Management Organisation

As discussed earlier, the materials management function of an enterprise plays as vital a role as production, marketing or finance functions. Many organisations have recognised this by centralising the entire materials management function under a materials manager at the highest executive level, on a par with managers of manufacturing, marketing and finance. Although several alternative structures are feasible depending upon the company's operations and its environment, a typical organisation structure for an industrial organisation is given in the chart below.



Once the overall organisational plan is established, the internal structure of the materials department must be formulated. Several alternatives are available to the manager. Some of the more common approaches are :

### 1. Organisation by function

This is the most widely used organisation technique. Here the materials management department is structured on the basis of functions such as materials planning, purchasing, traffic, stores and so on.

### 2. Organisation by location

This method may be followed in cases where the company has several plants located in different parts of the country. It involves decentralising the materials management function, either completely or partially in each location. Organisation by location is also sometimes followed by companies having large and extensive manufacturing facilities located at the same place. In this case receiving and stores sections may be located at several places in the same plant.

### 3. Organisation by product

Since the materials organisation exists to help make some product or service more profitably, breaking up materials activities by product is logical. Each materials

group is assigned to some product or group of products.

#### 4. Organisation by materials or commodities

Under this system of organisation, materials functions relating to a group of materials or commodities are assigned to an individual. For instance, in transport undertakings one purchase officer may specialise in autospare and another in general stores.

Each of the above methods of organising has its advantages and disadvantages. Consequently, the process of selecting one or combination of different structures involves a consideration of the relative advantages and suitability of each type at each level in the organisation structure.

#### Benefits of Integrated Materials Management

The grouping and integration of materials related functions is the essence of materials management and the major source of its benefits. Organisations which have adopted this integrated concept usually enjoy the following benefits.

1. Better coordination and reduction of inter-departmental conflicts. This is accomplished by eliminating "back passing" between the subfunctions and by providing a central figure to balance conflicting objectives. This also

establishes better accountability for materials functions.

2. 2. Reduction of inventory levels and greater assurance of materials availability. Inventory reduction is achieved by better coordination and improved communication among production, purchase and inventory control departments. Potential shortages are detected early and purchase action initiated to prevent expensive shortage and delays.

Gregory V. Schultz has quoted some of the reactions of managers in different US industries with regard to their inventory reduction experiences :

Without Materials Management, goods-in-process inventory would be \$ 150,000 higher, Stores \$ 200,000 higher. Inventory turnover has gone from 2.5 to 4.0.... Daily shortages on the line have nose-dived from 180 to 8. Spareparts order delinquency has dropped from 60% to 13%. 27

In a survey conducted by Gary J. Zenz among the users of materials management concept in USA, 38% of the respondents indicated that adoption of the concept result in inventory improvement in their organisations. Further, 29 % of these surveyed mentioned that it resulted in dollar savings and 24% agreed that production efficiency was improved. 28

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27 Gregory V. Schultz, "The Real Low-Down on Materials Management", FACTORY, December 1957, pp.49-58.

28 Gary J. Zenz, op.cit.p.20.

3. Improved supplier relations result from establishing delivery schedules on the basis of latest inventory position and production requirements, eliminating wide fluctuations in requirements and minimising emergency orders and rescheduling. The supplier finds his production smoother, and that it can be planned much farther in advance. The increased efficiency of suppliers also reduces production costs.

4. Paper work and duplication of work are reduced through better coordination and proper communication among persons performing related functions.

One company in U.S.A. is reported to have obtained the following benefits by adopting materials management organisation : (i) at least 35 hours of clerical time per week saved; (ii) duplicate order files and vendor price ledger books scrapped; (iii) individual paper requisitions decreased; (iv) slow moving stock of paper reduced by 50% and time required to take inventory out by 30%; (v) communication between purchasing and vendors improved noticeably as emergency buying, duplicate expediting, and needless paper shuffling were eliminated.

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29 "Materials System Ends Duplication", Purchasing,  
( New York ), February 24, 1966, p.83.



5. Improved customer service often results from reduced delivery time, proper stocking of the right materials and stabilisation of product quality through correct specifications, standardisation and selective inspection of incoming materials.

6. Reduced overall cost of materials as a result of using more scientific systematic and economical methods in the planning, acquisition, storage and control of materials. It enables a continuous and concentrated attack on all aspects of material costs. Techniques of materials management bring about reduction in cost and increase in profits more quickly and more easily than by any other methods.

### Growth of Materials Management

Although the idea of a unified materials organisation was developed by the end of 1940's, industrial and service organisations were rather slow in recognising its benefits and implementing the new structure. A survey conducted in 1967 revealed that only three per cent of the 45,000 manufacturing plants in the U.S. had materials managers. But the materials management concept has gained wider acceptance in recent years according to another survey conducted in 1979. Nearly half the manufacturers responding

to the survey had materials managers managers playing important corporate or divisional roles.<sup>31</sup> Even allowing for considerable confusion over job titles and other differences in survey methodology, the increase can be considered to have been quite substantial.

The situation in India also may not be any better, although no survey results have been reported regarding the extent of usage of integrated materials management in this country. Only very recently, several organisations are reported to have started creating materials management positions. "Although organisations may not be adopting a totally integrated approach, there is a definite tendency to move towards the integrated approach," observe the authors of a recent book on the subject.<sup>32</sup> This was probably accelerated because of credit squeeze and problems in the availability and high price of most of the materials.

It can be reasonably expected that there will be tremendous pressures in future to reduce costs of all kinds with the help of the concepts and techniques of modern

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31 Jeffrey G. Miller and Peter Gilmore, "Materials Managers : who needs them ?", Harvard Business Review, (Boston), Volume 57, Number 4, July-August 1979, pp.143-144.

32 P. Gopalakrishnan and M. Sundaresan, Op.mit. p.8

management. As the largest single block of corporate expenses in most enterprises is materials, the materials management function will assume greater significance. Cost and availability of materials will continue to become more critical to the profitability of the company. Consequently, the integrated materials management approach will grow at a faster rate and will become more widely accepted as an area of critical importance in manufacturing industries, service organisations and in government departments.

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**CHAPTER - II**

**STATE ROAD TRANSPORT UNDERTAKINGS**

**AN OVERVIEW**

## Importance of Transportation

The history of human civilisation is closely interlinked with the development and advancement in the field of transportation. The basic function of transportation is to move persons and goods from one place to another. In this process it plays a crucial role in the socio-economic development of any region. The Committee on Transport Policy and Coordination observed in 1966, "The significance of the transport sector lies not only in the specific services it renders, but even more in the unifying and integrating the influence it exerts upon the economy, enhancing productivity, widening the market, introducing new stimuli to economic activity, and bringing village and town and the remoter and the more developed regions closer to one another".

In the developed countries of the West, the transport system have not only accelerated the growth of industry and commerce, but also influenced their life styles and social relationships. While reviewing the contribution of the U.S. transport system to its economy, the U.S. Department of Transportation in its 1972 National Transportation Report

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1 Planning Commission, Committee on Transport Policy and Coordination, Final Report, Government of India, New Delhi, 1966, p.6

proclaimed, "The nation's transportation system is both a major component of the national economy and an important factor in shaping our life style, community development and industrial location patterns".

### Role of Road Transport

The domestic mechanised transport system in India consists of railways, road services, coastal shipping, inland waterways and airways. Railways and roadways are the two most important inland transport services in the country and they together carry more than 95 per cent of the inland passenger and freight traffic.<sup>2</sup> The relative shares of rail and road transport in the movement of freight and passenger traffic have undergone substantial changes over the years. As a result of the steady growth in road transport, its share in the goods traffic increased from nearly 12 per cent in 1950-51 to 33 per cent in 1976-77. During the same period, the share of road transport in the movement of passengers increased from nearly 26 per cent to about 61 per cent. Their relative shares from 1950-51 to 1976-77 are given in Table 2.1. It shows the predominant role played by the road transport in general and passenger road transport in particular in the transportation sector of the country's economy.

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2 Madhoo Pavaskar, Second India Studies : Transport, Bombay, Popular Prakashan, 1978, p.8

Table 2.1Relative share of Rail and Road Transport

Year	Passenger Transport (Percentage)		Goods Transport (Percentage)	
	Road	Rail	Road	Rail
1950-51	25.8	74.2	11.7	88.3
1955-56	33.6	66.4	13.1	86.9
1960-61	42.2 (42)	57.8 (58)	16.2 (28)	83.8 (72)
1965-66	46.1 (39)	53.9 (61)	22.5 (32)	77.5 (68)
1968-69	47.8 (59)	52.2 (41)	24.2 (34)	75.8 (66)
1973-74	49.1 (61)	50.9 (39)	30.7 (35)	69.3 (65)
1976-77	61.0	39.0	33.0	67.0

Source : Planning Commission, Government of India, Third Five Year Plan ( 1961-66), Fifth Five Year Plan ( 1974-78 ) and Sixth Five Year Plan (1978-83).

Note : The estimates given by the Draft Sixth Five Year Plan for the period 1960-61 to 1973-74 are shown in brackets. It is observed that there is some discrepancy between the estimates given by Draft Plans V and VI for the above period. However, the general trend indicated by both values is almost the same.

Road transport has several advantages over other forms of transport. Road transport alone can provide "door to door" service whereas all other mechanised modes of transport have

to be supplemented by road transport for at least a portion of journey. It also has an inherent flexibility enabling it to reach the remote areas for the speedy movement of people and materials at a comparatively low capital cost.

### Development of Road Transport

The mechanised road transport in this country started with the commencement of the present century. The first motor vehicle was imported to India in 1898. The number of motor vehicles during the early years was few and their operation was governed by the then provincial enactments. The (Indian) Motor Vehicles Act 1914 was the first all India enactment dealing with control over operation of motor vehicles.

The phenomenal growth of road transport began in the early 1920's as a result of the diversion of the surplus army vehicles to civilian market, after World War I. This also led to unhealthy competition and even rate cutting amongst the operators. The Motor Vehicles Act of 1914 had therefore to be supplemented in the post-war years by Provincial Acts in order to introduce some measure of regulation and control in the late 1920's. The problems of unhealthy competition became more acute and the shrinkage of traffic accentuated by



the worldwide depression necessitated regulation of this industry, both internally and in relation to the railways.

The Pope Committee ( 1932 ), Mitchell-Kirkness Committee (1932), Rail-Road Conferences (1933) and Wedgewood Committee (1936) suggested various measures to reduce rail-road competition and to ensure better coordination of services. Consequently the Motor Vehicles Act, 1939, was passed to regulate, control and coordinate the working of motor transport in the country. By 1938-39, the commercial motor transport comprised a total fleet of 23,645 buses and 12,397 trucks.<sup>3</sup>

In 1943, the Post-war Reconstruction Committee's Sub-committee on Transport urged for the "replacement of the small owner by large companies" in order to provide adequate services and better facilities for travel. This recommendation was reiterated by the Post-war Policy Committee on Transport ( 1944 ) and also by the Transport Advisory Council ( 1945). In pursuance of these recommendations, efforts were made to organise individual operators into bigger units. Several state governments also gradually

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3 Planning Commission, op.cit., p.76.

started taking over passenger services and running them as state enterprises.

In order to facilitate nationalisation of road transport, the Road Transport Corporations Act was passed in 1948. This Act having been declared ultra vires, another enactment known as RTC Act, 1950 was approved by the Parliament. It empowered the state governments to establish Road Transport Corporations for providing "an efficient, adequate, economical and properly coordinated system of road transport services".

#### Beginning of the State Transport Undertakings

The first state road transport undertaking made its appearance in the old Hyderabad State in the year 1932. This was followed by princely state of Travancore ( now part of Kerala ) in 1938. The Kutch State Road Transport Corporation ( now merged with Gujarat ) was formed in 1942. The Madras State Transport Department and the Ahmedabad Municipal Transport came into existence in 1947 and thereafter many States started their own services. Following the passing of the Road Transport Corporations Act, several states established road transport corporations for running the services. The

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↳ The Road Transport Corporations Act, 1950, Section 18.

year of establishment of the various State transport undertakings and the number of buses initially owned by them were as follows.

<u>Year of Establishment</u>	<u>State Transport Undertaking</u>	<u>Size of fleet (Buses)</u>
1932	Andhra Pradesh Road Transport Corporation, Hyderabad.	27
1938	State Transport Department, Trivandrum, Travancore State.	60
1942	Kutch State Road Transport Corporation, Bhuj, Gujarat.	77
1947	1. State Transport Department, Madras.	30
	2. Ahmedabad Municipal Transport, Ahmedabad, Gujarat.	60
1948	1. State Transport, Shillong, Assam.	98
	2. Bombay State Road Transport Corporation, Bombay.	35
	3. Mysore Government Transport Department, Bangalore.	120
	4. State Transport Services, Cuttack.	43
	5. Punjab Transport Service, Chandigarh.	13
	6. U.P. Roadways, Lucknow.	511
	7. Calcutta State Transport Corporation, Calcutta.	165
	8. Delhi Transport Undertaking, Delhi.	189

<u>Year of Establishment</u>	<u>State Transport Undertaking</u>	<u>Size of Fleet (Buses).</u>
1948	9. Bihar State Road Transport Corporation, Patna.	6
1949	1. Samrashtta State Road Transport Corporation, Rajkot.	78
	2. Himachal Government Transport, Simla.	52
1950	Poona Municipal Transport Services, Poona.	57
1951	Orissa Road Transport Company, Ltd., Berhampur.	55
1952	1. Madhya Bharat Roadways, Gwalior.	240
	2. Manipur State Transport, Imphal.	37
1953	1. Bombay Electric Supply & Transport Undertaking, Bombay.	456
	2. Provincial Transport Service, Nagpur.	102
	3. C.P. Transport Services, Jabalpur.	129
	4. Directorate of Transport, Jaipur.	12
1954	Jammu and Kashmir State Transport.	53
1955	Pepan State Road Transport Corporation, Patiala.	12
1956	1. State Transport Marathwada, Aurangabad.	160
	2. State Transport Service, Andaman & Nicobar Islands.	5

<u>Year of Establishment</u>	<u>State Transport Undertaking</u>	<u>Size of fleet(Buses)</u>
1959	M.K. Road Transport Corporation, Mandi, Himachal Pradesh.	56
1960	1. North Bengal State Transport Corporation, Cooch - Behar, West Bengal.	270
	2. Gujarat State Road Transport Corporation, Ahmedabad.	1779
1966	1. Haryana Government Transport Services, Chandigarh, Haryana.	485
	2. Chandigarh Transport Undertaking, Chandigarh.	30

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Source : Ministry of Transport and Shipping, Statistical Bulletin of State Road Transport Undertakings of India, Government of India, various years.

### Growth of Nationalised Transport

Road transport was placed in the second schedule of the Industrial Policy Resolution, 1956, because it was recognised that both the private and the public sectors, had a significant role to play in the development of this industry. Although, there has not been any major changes in this policy statement, most state governments have increasingly moved in the direction of public participation in passenger transport. The enlarging share of public sector in passenger transport over the years can be seen from Table 2.2.

**TABLE 2.2****Relative share of Public and Private Sectors  
in Passenger Road Transport**

<b>Year</b>	<b>Public Sector %</b>	<b>Private Sector %</b>
1952	19.30	80.70
1961	33.00	67.00
1967	36.70	63.30
1974 (estimate)	44.00	56.00
1979	55.50	44.50
1981	60.00	40.00

- Sources:**
1. J.N. Gupta, "In Defence of Public Sector Road Transport", State Transport News, Poona, Jan. 1970, pp. 5-9.
  2. Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1977-78, 1978-79, 1979-80 and 1980-81, CIRT, Poona.

The pattern of nationalisation of passenger transport in different states does not show any uniform pattern. Some states nationalised the entire passenger transport, others nationalised some routes, leaving other routes to the private operators, while some others eventually landed up with both public and private operating together atleast over some portions of the same routes. Table 2.3 indicates the share of nationalised transport in the various States. The figures relate to 1977-78.

**Table 2.3**

State	Total Buses/ lakh popu- lation	Public Sector buses per lakh population	Percentage of Public Sector to total
1. Gujarat	29	23	79.30
2. Maharashtra	28	22	78.50
3. Andhra Pradesh	18	12	66.70
4. Punjab & Haryana	26	17	65.40
5. Karnataka	34	15	44.10
6. Uttar Pradesh	15	6	40.00
7. Madhya Pradesh	13	5	38.40
8. Bihar	8	3	37.50
9. Kerala	35	12	34.30
10. Assam	18	5	27.80
11. Rajasthan	30	7	23.30

Source : Estimates based on statistics from Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1978-79 and 1979-80, CIRT, Poona.

#### State Transport Undertakings Today

The state transport undertakings today play a dominant role in passenger transport in the country. It was noted that the relative share of road transport, as against

Railways had increased from approximately 42 per cent in 1961 to 61 per cent in 1977.<sup>5</sup> At the same time, the share of public sector in the total passenger road transport increased from 33 per cent to more than 50 per cent during the same period. At the end of March, 1981 the total investment in public sector transport undertakings was approximately Rs. 1675 crores. The 70,000 odd buses operating in the public sector carried nearly 40 million passengers every day during 1980-81 providing direct employment to more than half a million people. Today, it is the biggest employment agency in the country after the railways and the defence services.

Some of the important statistics of the State Transport Undertakings relating to 1980-81 are given in Table 2.4.

The number of vehicles held at the end of March 1981, in individual undertakings varied from 15 in Kadamba TCL to more than 10,000 vehicles in Maharashtra BRTC. The fleet strength in different undertakings is furnished in Appendix -I. Analysis of the fleet strength shows that at the end of March 1981, there were 22 undertakings with a fleet strength of 500 or less vehicles. But there were only 6 undertakings with more than 3000 vehicles. The classification of undertakings based on the fleet strength is shown in Table 2.5.

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5 Table 2.1, p.32.

6 Table 2.2, p.39.



Table 2.4State Transport Undertakings  
Some Important Statistics ( 1980-81 )

1.	Number of undertakings	..	..	51
2.	Fleet strength as on 31st March 1981			
	(I) Passenger buses	..	..	69,550
	(II) Goods Trucks	..	..	1,819
	(III) Others	..	..	<u>2,885</u>
	Total	..	..	<u>74,254</u>
3.	Percentage of nationalisation ( based on fleet )			60.00 %
4.	Total capital investment as on 31-3-1981	..		Rs. 1674.85 crores
5.	Total revenue for the year 1980-81			Rs. 1345.28 crores
6.	Total effective kms during 1980-81			533.56 crores
7.	Total number of employees as on 31-3-1981	..		5.60 lakhs
8.	Average daily number of passengers carried	..		4.00 crores

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Source : Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings : 1979-80 and 1980-81, CIRT, Poona.

**Table 2.5**

**Fleet strength classification of  
State Transport Undertakings ( 31 March 1981 )**

<b>Fleet held</b>	<b>Undertakings</b>	<b>No. of Under- takings</b>
100 or less	Meghalaya STC, Mizoram TU, Kolhapur MTU, Tamil Nadu Goods TOL, Pimpri-Chinchwad MTU, Bholapur MTU, Municipal Transport Ludhiana, Jamnagar MTS, Kadamba TOL.	9
101 to 500	North Bengal STC, Pune MT, Thanthal Periyar TOL, Orissa RTOL, IMDC, Tripura RTC, Sikkim MT, Chandigarh TU, Orissa STOL, Durgapur STC, Bombay Metropolitan TOL, Manipur STC, Bagaloni ST.	13
501 to 1000	Pepsu RTC, Himachal Pradesh RTC, Cholan RWOL, Assam STC, Orissa STC, Kattabomman TOL, Ahmedabad MTS, Anna TOL, Pallavan TOL ( Dist ), Thiruvalluvar TOL.	10
1001 to 2000	Bihar STC, Pallavan TOL (Metro) Jammu & Kashmir RTC, Calcutta STC, Cheran TOL, Pandiyan RWOL.	6
2001 to 3000	Delhi TC, Madhya Pradesh STC, Haryana ST, Rajasthan STC, SMT Undertaking, Punjab ST.	6
3001 to 6000	Karnataka STC, Kerala STC.	2
6001 to 9000	Andhra Pradesh STC, Gujarat STC, Uttar Pradesh STC.	3
Above 9000	Maharashtra STC	1

**Source :** Compiled from the Report on the Performance of  
Nationalised Road Transport Undertakings 1979-80  
1980-81, CIRT, Poona.

## The Organisational Pattern

Road transport is a state subject and, therefore, the pattern of establishment and running of public transport undertakings varies from state to state. The set up of these undertakings in India can be divided into four categories as follows.

(i) Road transport corporations set up under the RTC Act of 1950. Majority of the undertakings such as in Kerala, Karnataka, Maharashtra, Gujarat, Andhra Pradesh etc., fall in this category. <sup>7</sup> There are 22 such corporations.

(ii) Companies set up under the Indian Companies Act, 1956. There are 13 such transport companies.

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7 The Committee on Transport Policy and Coordination observed in its final report : " .... in addition to bringing about greater coordination in services, corporations are essential for mobilising the internal resources needed for the continuous expansion of road transport undertakings and for measuring and enforcing standards of efficient management. Corporations would have much greater autonomy in the management and operations of commercial services, in the use of internal resources and in mobilising resources for future development than obtains in the case of departmental undertakings. The RTC Act, 1950 under which corporations are set up, provides considerable scope for corporations to function on commercial lines and enables them to take and implement decisions speedily without being tied down by rigid procedures? See Planning Commission, op.cit p.102.

(iii) Departmental undertakings of the State Governments, such as in Punjab, Haryana, Nagaland, Sikkim etc. There are 6 departmental transport undertakings.

(iv) Undertakings managed by the municipalities such as BEST Undertaking, Ahmedabad Municipal Transport Services, Poona Municipal Transport, etc. There are 9 such undertakings.

The list of undertakings falling under the different set up is given in Appendix - II.

The legal framework of these undertakings is different as also their administrative set up. The absence of any uniform pattern in their set up can be observed from the fact that the transport undertakings in the four metropolitan cities of India have been organised in four different ways. Whereas Bombay has a Municipal Undertaking, Madras has Pallavan Transport Corporation constituted under the Indian Companies Act. Calcutta has a Corporation under the RTC Act established by the State Government and the Delhi Transport Corporation is constituted under the same Act but established and controlled by the Central Government.

The number of layers or tiers in the administrative set up also varies for different undertakings. In Maharashtra State Road Transport Corporation (MSRTC) and in Andhra

Pradesh State Road Transport Corporation ( APSRTC ) there are four tiers - the Central Office, Regional Office, Divisional Office and Depot. In organisations like UPRRTC ( Uttar Pradesh ), Karnataka SRTC and Gujarat SRTC it is a three tier administrative set up. In some undertakings like Haryana and Punjab State Transports there are only two tiers - Head Office and Depot.

### Future Scenario

The passenger road transport industry has grown at a much faster pace than the railways during the past three decades. From nearly 26 per cent of the total transport of 1950-51, it has grown to 61 per cent in 1976-77.<sup>8</sup> Different forecasts suggest that the passenger traffic in 2000 AD will not be less than 1000 billion passenger kilometres, about 90 per cent of which will be met by rail and road alone.<sup>9</sup> Assuming that this forecast will be reasonably accurate, rail and road transport together will have to meet a demand of 900 billion passenger kilometres.

The share of road transport, it was estimated, would be around 66 per cent of the total rail and road passenger traffic.<sup>10</sup> But it is felt that this estimate is slightly

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<sup>8</sup> See table 2.1, p.32.

<sup>9</sup> See Mahoo Pavaskar, *op.cit.* p.55 and N.S. Srinivasan, "National Transportation Perspective" in the course materials prepared for the programme "Project Formulation, Implementation, Monitoring and Evaluation - Road Transport" conducted by the Kerala Institute of Public Administration, Trivandrum from 10 June to 7 July 1980.

<sup>10</sup> Ibid.

on the lower side since the actual share of road transport in 1976-77 itself was placed at 61 per cent. The recent report of the National Transport Policy Committee headed by Shri B.D. Pande also envisages an increasingly important role for passenger road transport in the country's future transportation system.<sup>11</sup> The National Council of Applied Economic Research has suggested in one of their studies, that due to the high priority placed on employment generation in national planning and the fact that in road transport employment generation is twice that of in other sectors, the chances for the growth of road transport would be higher.<sup>12</sup> Even if only a moderate growth rate of half per cent per annum is assumed ( growth rate during the period 1960-61 to 1976-77 was more than one per cent per annum ), the share of road transport in 2000 AD will be nearly 75 per cent. Expressed in absolute figures, the share of road transport will be 675 billion passenger kilometres, out of the total projected rail and road traffic of 900 billion passenger kilometres.

The share of public sector in the total passenger road transport registered a substantial growth from 19.30

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11 B.D. Pande, "Coordinating Transport", Commerce (Bombay) Annual Digest, 1980, pp.107-111.

12 Cited in the Financial Express, Bombay, 23 June 1980.

per cent in 1952 to 60 per cent in 1981.<sup>13</sup> It can be reasonably expected that its share will not be less than 65 per cent by the end of the century. This means that the public sector road transport undertakings will have to cater to a demand of approximately 440 billion passenger kilometres ( 65 per cent of 675 billion passenger kilometres). The state transport undertakings will have to be considerably strengthened and streamlined to meet this growing demand for passenger transport.

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13 See table 2.2, p.39.

**CHAPTER - III**

**RESEARCH OUTLINE**



The growth and development of the state transport undertakings in general was briefly reviewed in the previous chapter. A future scenario of the road transport services in the year 2000 AD was also briefly presented. It was estimated that the state transport undertakings alone would have to cater to a demand of nearly 440 billion passenger kilometres. This is a tremendous task. Its magnitude can be gauged from the fact that the actual passenger kilometres operated by all the STU's in 1980 was only 130 billion which means that more than 330 % growth has to be planned for in less than two decades.

In order to meet a demand of 440 billion passenger kilometres adequately, STUs must expand their fleet strength nearly fourfold within the next 20 years. They must also create other supporting facilities to operate and maintain such a large fleet. A large amount of capital resources would be required to undertake such a massive expansion. Moreover, replacing old and worn-out buses and providing better amenities to the passengers would also require substantial investments.

As against this background, analysis of the financial performance of the state transport undertakings in recent

years shows an alarming picture. In 1960-61, the STUs generated a net surplus of Rs. 8.42 crores, compared to a net deficit of Rs. 5.04 crores in 1970-71. Since then the deficit has been increasing sharply. The total deficit in the year 1979-80 was as high as Rs. 111.36 crores which is about one tenth of the total capital invested by all the undertakings. The estimated losses by all the STUs for the year 1980-81 is to the tune of Rs. 215 crores.<sup>1</sup>

Review of the financial performance of STUs during the last five years shows that the gap between revenue and costs is widening every year. The accumulated losses are nearly Rs. 650 crores. Analysis of the cost-revenue ratio for the state transport corporations having more than 1500 buses showed that in 1979-80, it was the highest for Kerala State Road Transport Corporation followed by Rajasthan SRTC.<sup>2</sup> in the same year. Fleet utilisation, which is an important indicator of operational efficiency, was also found to be as low as 60 - 70 % in many undertakings. Low fleet utilisation often reflects poor maintenance of

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1 N.V. Bagade, "What ails state transport", Commerce (Bombay) Vol. 14, No. 3698, April 24, 1982, p.686.

2 Mahesh Chandi, "Financial Performance of Public Road Transport Undertakings", Lok Udyog (New Delhi), Vol. 16, No.1, April 1982, pp. 33-34.

of vehicles and inefficient management of spareparts inventory.

It is evident from the above that most of the state transport undertakings are facing serious problems regarding their efficiency and profitability. The need for the economic performance of these undertakings was clearly stressed in the Road Transport Corporation Act of 1950. Section 18 of the Act states : "It shall be the general duty of a corporation to exercise its power as progressively to provide or secure or promote the provision of an efficient, adequate, economic and properly coordinated system of road transport service in the state". Section 20 of the Act adds: "It shall be the general principle of a corporation that in carrying on its undertaking, it shall act on business principles". This implies that although STUs need not make exorbitant profits, disregarding all other considerations, they must make reasonable profits to meet their operational and expansion requirements.

Profitability has become an important criterion for judging the performance of a public utility service, inspite of the several social and political considerations involved.

While commenting on the profitability of state transport undertakings in India, Prof. N.S. Ramaswamy writes :

It has been often argued that STUs can neither make profits nor they can generate internal resources on account of public policy and controls, where the fare structure is regulated by the political process. It has also been argued that as a public utility they have been compelled to run in uneconomic routes thereby depressing their overall financial structure. Even granting that these two arguments are correct, still such a poor rate of return cannot be justified.

Profitability can be increased by reducing the cost of inputs and/or by generating more revenue from the same inputs through better utilisation of resources. State transport undertakings must closely scrutinise their operations to improve their profitability so that atleast part of the capital required can be met by internal resources. Detailed analysis of the existing practices in managing personnel, materials, vehicles and other resources in STUs can reveal areas of inefficiency and scope for improving their utilisation.

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3 N.S. Ramaswamy, "Poor Professional Management in Road Transport", paper presented at the National Seminar on Productivity in STUs held at Bangalore on 26th and 27th November, 1976.

In order to identify areas for cost reduction and profit improvement, it is necessary to understand the relative share of the various cost components in the total cost. Break-up of the total cost for all STUs for the year 1980-81 shows the following pattern.

Table 3.1

Break-up of Total Operating Cost of all STUs  
1980-81

<u>Components</u>	<u>Percentage</u>
i) Materials	37
ii) Personnel	29
iii) Taxes	15
iv) Depreciation	10
v) Interest, etc.	9
<b>Total cost</b>	<b>100</b>

Source : Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1979-80 and 1980-81, CIRT, Pune, p.3.

It can be observed that the cost of materials forms the most important component, followed by cost of personnel.

Together they control 66% of the total cost. Hence any attempt on cost reduction must be focussed first on these two vital areas in order to realise any significant results.

Efforts to reduce cost of personnel has obvious limitations. In almost all the state transport undertakings there are one or more strong trade unions. Proposals to rationalise the staffing pattern, revise norms of work, etc. are likely to be met with stiff resistance from them. Moreover they continuously clamour for higher wages, bonus and better working conditions for the employees. The unions are also likely to resist any reduction in the ratios determining the number of employees per schedule. Under these circumstances, the scope for reducing the cost of personnel in these undertakings is rather limited.

Control of materials cost, on the other hand, is easier to undertake and offers greater opportunities for profit improvement. Unlike personnel, materials may not invite resistance or opposition from employees to management policies. Besides reducing the cost, scientific management of materials releases the capital tied up in excess inventory. It may also help to <sup>improve</sup> fleet utilisation through availability of the right type of materials. Hence a study of the prevailing practices of materials management in the state transport undertakings would be quite useful in identifying weak spots and in

suggesting methods for better management of materials, thereby helping to improve their financial performance and operational efficiency.

### Survey of literature

An attempt has been made here to assess the extent of research work done and the type of literature already available in the area of road transport management in general, and materials management in the state transport undertakings in particular. Although most of the works relating to the management of nationalised transport in the country have been reviewed this cannot be considered as an exhaustive survey of all the literature in the field.

In spite of its predominant role, road transport has not been given adequate importance by the researchers in the past. This is true not only for road transport, but for the entire field of transport. Reviewing the trend of research in the transport sector, Mridula Krishna writes, "Very little attention has been given by the universities and other academic institutions to research in the transport sector in general and its economic and public administration fields in particular?"

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4 Mridula Krishna, "Economics of Transport : A trend report" in A Survey of Research in Economics, Vol. VI, Infrastructure, ICSSR, Bombay : Allied Publishers, 1980, p.59.

The available literature on road transport mainly consists of the reports submitted by the specially constituted committee commissions of the Government of India on State Governments or non-official organisations, the doctoral dissertations on problems in road transport management submitted to the various Universities in the country and the articles and research papers published in different journals. A few books have also been written on the development, administration and problems of road transport management.

For the convenience of review and analysis, the related literature identified have been classified into four groups, namely :

- i) Books
- ii) Study reports and statistical bulletins
- iii) Doctoral dissertations
- iv) Articles, research papers and seminar proceedings

#### Books

Most of the books available in the area are general studies on the development and problems of road transport. There are only very few books relating to the management of road transport undertakings in the country. One such book is the 'Productivity in Road Transport' by Santhosh Sharma. The

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5 Santhosh Sharma, Productivity in Road Transport, New Delhi, Association of Road Transport Undertakings. 1976.



author has attempted to apply some of the modern management concepts and techniques to the management of passenger road transport undertakings. He identifies the critical factors which lead to diseconomies in bus operation and indicates methods of designing efficient routes and schedules and improving manpower productivity through proper personnel management systems. The book also highlights the importance of increasing fleet availability through rational maintenance systems. Although materials management has been briefly dealt with, the importance and vast potential of this function in improving the performance of STUs has not been adequately emphasised in the book.

The course materials prepared by the CIRT, Pune for its Correspondence Course in Transport Management contain one <sup>6</sup> volume on Materials Management. This is the only study available, which discusses the general principles and functions of materials management with particular reference to state transport undertakings in India. But this forms part of the course material supplied to the students and it has not been published for wider circulation.

The Association of State Road Transport Undertakings has recently published a study of materials management practices

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6 Central Institute of Road Transport, Course materials of the Correspondence Course in Transport Management, Vol. III (Materials Management), Central Institute of Road Transport, Poona.

in a few undertakings.<sup>7</sup> It describes some of the materials management practices in fine selected undertakings in the country. However, it does not make any comparative study or critical evaluation of the different systems and practices in STUs. As such, it provides only a general description of some of the aspects of materials management in these undertakings.

### Study reports and statistical bulletins

Government of India has constituted several committees and commissions from time to time to study about the various aspects of road transport in the country. A few Universities and other academic institutions have also undertaken studies on certain aspects of road transport. Reports of these committees and study groups form one of the major sources of literature on transport. However most of these reports deal with the development, coordination and control of the different modes of transport, rather than with the management of the transport undertakings as such.

The recent report of the National Transport Policy Committee of the Planning Commission analyses the passenger and freight traffic and estimated the requirements of transport

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<sup>7</sup> Association of State Road Transport Undertakings, Study of Materials Management Practices in some STUs, New Delhi. ASRTU, 1981.

in the next two decades.<sup>8</sup> In the case of road passenger transport, the Committee has suggested that the first priority should be on improvement, consolidation and strengthening of the existing rationalised road transport corporations before extension to new areas. The need for improving their financial and operational efficiency has also been emphasised in the report.<sup>9</sup>

Among the various committee reports and studies undertaken, only three reports or studies, although briefly, dealt with the problem of materials management in state transport undertakings. The Digest of Studies on State Road Transport Undertakings by the Committee on Plan Projects was the first study on this subject.<sup>10</sup> The committee prepared brief case studies relating to inventory control practices in four selected state transport undertakings. The study found a definite relationship between profit and fleet utilisation in these undertakings. It also showed how proper inventory management could result in higher fleet utilisation, without increasing the total investment in inventory.

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8 Planning Commission, Report of the Committee on National Transport Policy, Government of India, 1980.

9 B.D. Pande, op.cit. p.110

10 Committee on Plan Projects, Planning Commission, Government of India, Digest of Studies on State Road Transport Undertakings in relation to Inventory Control and Vehicle Maintenance, Planning Commission, New Delhi, 1964.

The study group on city services constituted by the Association of State Road Transport Undertakings examined the various aspects of operation, cost and management of the four major city transport undertakings namely Ahmedabad Municipal Transport, BEST undertaking, Calcutta State Transport and Delhi Transport Undertakings.<sup>11</sup> It analysed the comparative statistics relating to the cost of operation, cost of materials consumed, materials break-up and the inventory held by these undertakings. The study highlighted the wide variations in material costs and inventory levels in these city transport undertakings.

The Government of Kerala set up a Committee on Road Transport in 1975 to study about the various aspects of operation of the Kerala State Road Transport Corporation (KSRTC) and make recommendations for improving its operational efficiency and financial results. The Committee, in its report on the working of KSRTC examined, *inter alia*, the inventory holding, inventory control methods adopted and their consequences in this state transport undertaking. It made several recommendations for improving the purchasing, stores and inventory control functions.<sup>12</sup>

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11 Association of State Road Transport Undertakings, Report of the Study Group on City Services, ASRTU, New Delhi, 1971.

12 Committee on Road Transport, Report on the working of the Kerala State Road Transport Corporation, Government of Kerala, 1977, pp. 58-84.

The statistical bulletins and reviews of the public sector road transport published by the Transport Research Division of the Ministry of Shipping and Transport contain a lot of valuable data and analysis of the operation, costs, inventories and resource utilisation in these undertakings.<sup>13</sup> The reports on the performance of the state road transport undertakings in India, published by the Association of State Road Transport Undertakings are also important sources of information about the undertakings.<sup>14</sup> These reports present detailed analysis and comparisons of the performance indicators relating to most of the state transport undertakings in India.

#### Doctoral Dissertations

Another important source of literature on road transport is the research work done in universities and other academic institutions for the award of Ph.D degrees. A detailed survey of the doctoral dissertations accepted by the Indian universities till 1980-81 showed 28 dissertations on various aspects of passenger road transport industry. The list is given in the bibliography. Most of them are studies on the

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- 13 Transport Research Division, Ministry of Shipping and Transport, Statistical Bulletin of State Road Transport Undertakings of India published annually (Government of India) from 1958-59 to 1967-68 and Review of Public Sector Road Transport published annually (Government of India ) from 1968-69 onwards.
- 14 Association of State Road Transport Undertakings, Report on the Performance of State Road Transport Undertakings in India, published annually from 1974-75 onwards.

development, administration and problems of the passenger road transport undertakings.

Subjectwise analysis of the dissertations as indicated in their title, shows that there are only a few studies dealing specifically with the personnel, financial and other major functional areas of management in road transport undertakings. Considering the total number of doctoral dissertations submitted till 1980-81 on passenger transport industry, it must be stated that the number of research studies undertaken on these critical management areas is quite inadequate. It is rather surprising that materials management in state transport undertakings has not been studied so far for doctoral thesis, although materials account for the largest chunk of total cost in all these undertakings.

Analysis of the number of doctoral dissertations on the different state transport undertakings shows that maximum number of dissertations - four of them, was undertaken on the working of the Kerala State Road Transport Corporation, followed by the three studies on the U.P.State transport and two studies each on the undertakings in Madhya Pradesh, Delhi and Poona. It may be noted that the four research works completed on KSRIC have mainly dealt with

the development, administration, rate structure and performance aspects of the undertaking. The materials, personnel or financial management aspects have not been adequately emphasised in these research studies.

#### Articles/research papers/seminar proceedings

Besides the books, study reports and doctoral dissertations already reviewed, a large number of articles, seminar papers, pamphlets, etc. have been published on the different aspects of the road transport industry. As it is difficult to prepare an exhaustive list of all such writings, only those pertaining to the organisation and management of nationalised road transport in India have been attempted. These are given in the bibliography. Among them the proceedings of the workshops held by the Central Institute of Road Transport, Poona on 'Inventory control' (1977), 'ABC Analysis' ( 1979 ), 'Effective Provisioning and spare-parts Management' (1979) and 'Demand Forecasting' (1979) require special mention. All these proceedings give valuable information regarding the practices of inventory control and other aspects of materials management in the participating undertakings. A review of the literature shows that articles and research papers dealing exclusively with the materials management aspects of road transport undertakings are rather limited.

### The Present Study

The foregoing survey of the related literature in the field indicated the absence of any major research studies on the materials management practices in the state transport undertakings. This is in spite of the fact that materials cost is the most important element of the total cost in state transport undertakings and it offers the maximum potential for cost reduction and profit improvement. Hence it was decided to make a detailed study of the materials management organisation, systems and practices in one of the selected state transport undertakings and compare it with the practices in other similar undertakings in the country.

Kerala State Road Transport Corporation ( KSRTC ) has been chosen for the purpose of detailed study and analysis. Compared to the Maharashtra STTC with a fleet strength of more than 9000 vehicles and the many small municipal undertakings having less than 300 vehicles in their fleet, KSRTC with a fleet strength of about 3000 vehicles represents a typical large undertaking. Hence comparisons and generalisations will be more appropriate. Like most of the large transport undertakings, KSRTC has been set up as a Corporation and it operates both city and district transport services.



KBRTC has been incurring losses continuously since 1968 and the total accumulated losses at the end of 1982-83 are expected to be more than Rs. 65 crores.<sup>15</sup> Hence it is felt that the study of such an undertaking would be extremely useful.

The following researchable questions were formulated for the purpose of detailed investigation.

1. What is the organisational set-up of Materials Management in KBRTC ?
2. What are the Materials Management systems practices in KBRTC ?
3. How do these practices in the KBRTC compare with similar practices in other major STUs in India ?
4. Are the existing organisational set-up, practices and systems adequate to ensure efficient and effective management of materials in KBRTC ? If not, what changes are required ?

#### Objectives of the study

The proposed study has the following specific objectives :

1. To examine the organisational set-up and practices of materials planning, purchasing, store-keeping, inventory control and other related aspects of materials management in KBRTC.

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<sup>15</sup> "Kerala Road Corporation loss total 51 crores"  
The Hindustan Times ( New Delhi ), Saturday,  
 5 June 1982.

- ii. To compare the materials management set-up and practices in KERTC with other major SIUs in India and to bring out their important differences.
- iii. To identify and suggest methods for improving the materials management systems and practices in KERTC.

### Methodology

The following research methods were used in collecting the necessary data regarding the state transport undertakings.

### Data regarding KERTC

i) Personal Interviews : The managers and senior officers at the Central office, Trivandrum, Chief store, Pappanamcode and the Regional chief store, Alwaye were personally interviewed by the researcher during August-September 1980, to collect data regarding the systems and practices of materials management.

ii) Analysis of records : The official records and files relating to the various aspects of materials management, maintained at the chief store, Pappanamcode, Regional chief store, Alwaye, Controller of Purchase & Stores, and the statistical section at the central office, Trivandrum were analysed during August-September 1980. The statistical and other data collected earlier were again updated during March 1982.

## Data regarding other STUs

1) Mailed Questionnaire Survey : A detailed questionnaire was prepared to collect data regarding the practices in other state transport undertakings. A copy of the questionnaire is given in Appendix III. The questionnaire sought information, inter-alia, on the following aspects :

- organisational set up for materials management
- specific functions included under materials management
- delegation of authority
- purchasing methods and sources
- stores set-up and procedures
- classification and codification methods used
- inventory control systems followed

The questionnaire was sent to the Chief Executive Officers of all the State Transport Undertakings in the country numbering about 50, requesting them to furnish the necessary data. However, even after follow up, only five STUs returned the completed questionnaire.

ii) Analysis of published data : The questionnaire survey was supplemented by published data. The major sources of published data were :

- the Annual Administration Reports of STUs
- Statistical Bulletins and Reviews of the Ministry of Shipping and Transport

- Statistical reports of the Association of State Road Transport Undertakings
- Workshop proceedings of the Central Institute of Road Transport, Pune

They all provided valuable information regarding the inventory levels, materials consumption, purchases and the methods and practices with regard to them followed in these undertakings.

### Data Analysis

Statistical data pertaining to the overall performance, materials consumption, inventory holdings and other important aspects have been analysed manually. Intra-firm analysis of data in KSRTC has been undertaken over a 14 year span, i.e. from 1964-65 to 1978-79. However for inter-firm analysis among the selected STUs, special emphasis was placed on the five year period from 1974-75 to 1978-79.

For the purpose of detailed inter-firm analysis, four state transport undertakings namely Karnataka STTC, Andhra Pradesh STTC, Gujarat STTC and Maharashtra STTC have been chosen besides KSRTC. All these undertakings operate both district and city services, their operating regions have comparable terrains and all of them are large undertakings with a fleet strength of over 3000 vehicles. In certain cases statistical data relating to a few other selected

undertakings have also been analysed and comparisons made. Data for 1979-80 have also been used, depending upon the availability of such data.

### Scope and limitations

The detailed study and analysis has been carried out with respect to the practices and systems of materials management in KARTIC. The statistical data of KARTIC from 1965-66 to 1978-79 has been analysed. But for comparison among other selected undertakings, a shorter period from 1974-75 to 1978-79 has been used. The study of KARTIC has been primarily focussed on the planning and control of materials at the two main stocking points, namely the Chief store, Trivandrum and the Regional chief store, Alwaye. This is because of the magnitude of the inventory involved and the variety of inventory items handled by them and since supplies to the operating units are effected from these stores. Major decisions on the purchase and stocking of materials are also taken and initiated from there. Hence it is expected that improvement in the management of inventories at the central stores will have direct effect upon the sub-stores as well.

This study has several limitations. They include the followings:

1. Among the five similar undertakings chosen for detailed analysis, KSRTC is the smallest undertaking with respect to fleet strength. Although, wherever possible, data regarding smaller undertakings have also been obtained and analysed, most of the comparative analysis has been among the sample undertakings.

2. Analysis of the practices among the other undertakings in the sample is based mainly on the published data, since response to the questionnaire survey was poor.

3. Latest data was not available regarding most of the undertakings as the Annual Administration Reports are often delayed by 2-3 years or even more for some undertakings. For certain undertakings like Haryana ST, Rajasthan SRTC, Uttar Pradesh SRTC, Poona Municipal Transport and Ahmedabad Municipal Transport, the reports were either in Hindi or in the regional language in the respective states. Hence the researcher could not make use of these reports fully and conduct detailed comparative analysis of a large number of undertakings.

4. The items chosen for analysis of stock levels, lead times, stockouts, forecasting simulation, etc. are not selected strictly on random basis.

5. Most of the statistical data used in the analysis were obtained from the Annual Administration Reports of the respective undertakings. Some of the data, particularly for the period from 1974-75 to 1978-79 were compiled in a standard format by the Central Institute of Road Transport, Poona on the basis of the information provided by the undertakings. Since all these data were collected and supplied primarily by the individual undertakings, the quality of such data cannot be assured. It was, for instance, observed that there was no uniform pattern among the undertakings with respect to the items grouped under "other stores". But this may not significantly affect the analysis and the conclusions arrived.

#### Chapter Outline

This study seeks to examine the prevailing systems and practices of materials management in KSRIC and to compare it with other selected large undertakings in the country. It also attempts to suggest methods for improving the performance of materials management function.

The thesis is divided into 10 chapters. Chapters I and II are primarily introductory chapters. Chapter I discusses the Materials Management function in general, its importance, evolution and scope of integrated Materials Management. The

interaction of Materials Management function with other subsystems in the organisation, overall objectives of the function, methods of organising it under different situations and the likely benefit from an integrated set-up are also dealt with in this chapter. Chapter II provides an overall picture of the importance and development of road transport, beginning and growth of state transport undertakings and their present set-up. It also presents a future scenario of passenger road transport industry in the year 2000 AD and indicates the challenging role to be played by the state transport undertakings.

Chapter III identifies the major problems facing STUs and indicates the role of Materials Management in improving the performance of the undertaking. Further, the related literature in the field is reviewed and the need for undertaking the present study is indicated. The chapter also discusses the objectives of the study and methods of data collection and data analysis.

In Chapter IV an overall quantitative analysis of the trends within K&MTC and comparisons with other selected undertakings are made, using mostly the published statistical data. The analysis makes use of important indicators like



materials consumption per bus and per kilometre, inventory holdings per bus and per kilometre, inventory for number of months consumption and the inventory position has been related to the quality of service provided by the corporation. The general progress of K&BRTC vis-a-vis other STUs has also been analysed.

Chapter V deals with the evolution and present organisation of Materials Management in K&BRTC within the framework of the overall structure. In the first instance, the overall set-up in K&BRTC is examined and compared with other STUs and a new set up is suggested. Thereafter, the Materials Management structure, its evolution, present set up and its weaknesses have been dealt with and a modified Materials Management organisation is suggested after analysing the set up in other STUs.

In Chapter VI the general problem of materials planning and the quantitative techniques available for improving the materials planning and decision-making are discussed and the present practices of materials planning in K&BRTC and in other STUs are examined. A manual simulation of three forecasting methods namely, exponential smoothing, average past consumption

method and last period forecast has been attempted, using the data for selected items from KERTC. Forecast errors have been computed and analysed. The need for using more refined methods like exponential smoothing in state transport undertakings has been emphasised. Chapter VII discusses the purchasing principles, procedures and practices in KERTC and in other STUs. It also examines the extent of authority delegation in purchase department.

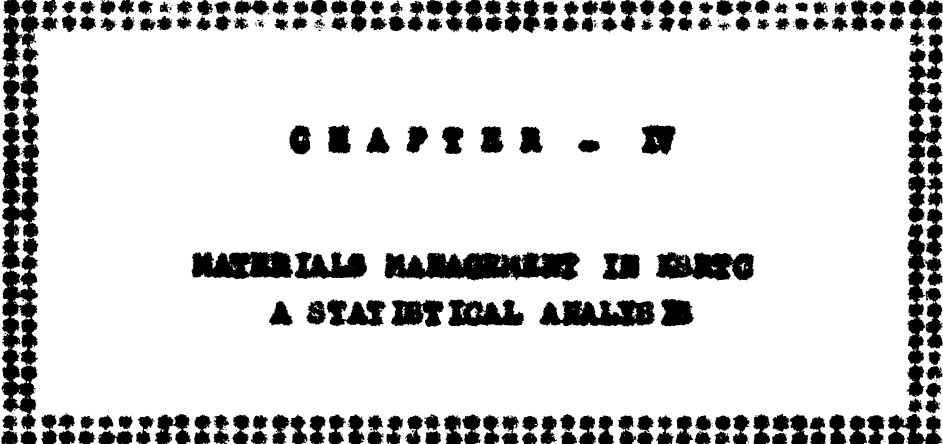
Chapter VIII deals with the stores set up and procedures in KERTC as well as in other STUs and the method of codifying, standardising and simplifying the stores items. The importance and methods of controlling the obsolete and surplus materials in stores are discussed on the basis of a sample study.

Chapter IX discusses the basic principles of inventory management and reviews the existing systems of inventory control in KERTC as well as in other major STUs. Thereafter major weaknesses of the inventory control system in KERTC are highlighted using the data relating to the frequency of stockouts, reviewing and reordering practices, leadtime

distribution, etc. for different items. A new inventory control system has been developed for MSKIC, keeping in view the selective approach to inventory control.

The last chapter, i.e. Chapter X summarises the conclusions and recommendations made in the study. It also indicates areas for further research.

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**CHAPTER - IV**

**MATERIALS MANAGEMENT IN KIRTCG  
A STATISTICAL ANALYSIS**

This chapter seeks to examine the materials management practices in KSRTC, using certain indicators such as materials consumption per bus, materials consumption per kilometre, inventory holdings per lakh kilometres, inventory for number of months consumption, etc. and relate them to the quality of service provided by the Corporation. The trend in these indicators during the period 1965-66 to 1978-79 has been analysed to identify any significant changes in the working of KSRTC. These are then compared with the patterns in other similar undertakings. For the purpose of comparison four other undertakings - Karnataka STC, Andhra Pradesh STC, Gujarat STC and Maharashtra STC have been chosen. These four undertakings alongwith KSRTC form the sample for the detailed comparative analysis.

Some of the more important terms and concepts used in the analysis are as follows :

State Transport Undertaking ( STU ) means any undertaking providing road transport service, where such undertaking is carried on by -

- a) central government or state government; or
- b) any road transport corporation, established under sec. 3 of the Road Transport Corporation Act 1950 ( Act 64 of 1950 ); or
- c) any municipality or any corporation or company owned by the central government or one or more state governments or by the central government and one or more state governments.

Route means a line of travel which specifies the highway may be traversed by a motor vehicle between one terminus and another.

Vehicle schedule is the programme of operation of a vehicle on one or more routes operating one or more trips within 24 hours.

Effective kilometres means the distance in kilometres actually operated by public service vehicles for purpose of earning revenue.

Breakdown is defined as stoppage of vehicle on road due to mechanical defects or other failures rendering the vehicle immobile or unfit for continuation of the revenue-earning trip without attention to it, irrespective of the time involved.

Accident is an occurrence in the use of a vehicle on revenue earning trip resulting in injury to or death of a person and/or damage to property.

Vehicles are said to be on road when they do schedules in full or in part or do extra trips for fairs etc. or casual contracts and will exclude staff and other vehicles used for departmental purposes.

Average number of vehicles held during any specified period can be arrived at by adding the total number of vehicles held by the unit from day to day in the period and dividing by the total number of days in the period.

Fleet utilisation is the ratio of the number of vehicles on road to the fleet held by the unit. Fleet utilisation is expressed as a percentage. It indicates how many of the total vehicles held are actually utilised for operations.

Vehicle utilisation ( in kilometres ) per vehicle held per day is the productivity of a fleet. This is calculated by dividing gross or effective kilometres done by the fleet strength.

### Origin of KERTC

The history of state transport service in Kerala dates back to 1938, when for the first time, a state transport service was formed as a government departmental undertaking in the erstwhile princely state of Travancore. The road from Trivandrum to Cape Comorin, a distance of 90 kms was selected as the first route to be nationalised. The State transport bus services were operated on this route from

21st February 1938 onwards. The initial fleet consisted of 39 buses. This marked the beginning of the public road transport service in Kerala.

The State Transport Department began in a small way operating services only in one route to begin with. But its operations were enlarged year after year. On the formation of the Kerala State on 1st November 1956 the name of the department was changed from Travancore-Cochin Transport Department to Kerala State Transport Department, but it continued as a departmental operation.

In order to achieve greater administrative efficiency and to be in line with the national policy, the Kerala State Road Transport Corporation (KSRTC) was established as an autonomous corporation with effect from 15th March 1965, under the RTC Act 1950. The Kerala State Transport Department was wound up. The responsibilities of the Department were taken over by the Corporation with effect from 1st April 1965.

#### Growth of KSRTC

At the time of its formation, the Corporation owned 901 buses and operated 661 schedules with a scheduled daily

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1 "Heavy Taxation, Wage Increase and Cancelled Trips cripple KSRTC's Work", State Transport News, (Poona), January 1973, pp. 8-10.



operation of 1,66,543 kms. It carried nearly four lakh passengers and earned Rs. 1.6 lakhs daily. In 1981-82 the Corporation owned 3250 buses, operated 2574 schedules and carried 21 lakh passengers.

Some selected indicators showing the general progress of KMKC between 1965-66 and 1979-80 are given in Table 4.1. It is seen that the average number of vehicles held by the Corporation increased by 241 per cent and the effective kilometres operated by the Corporation increased by 254 per cent during the period. Except during 1970-71, the growth rate of effective kilometres operated was found to be higher than that of the average number of vehicles held, indicating higher vehicle utilization. The total number of passengers carried and the total staff employed by the Corporation grew more or less at the same rate - 299 and 304 per cent respectively, during the review period. However, rather strangely, the increase in total staff employed was more closely related to the total passengers carried than to the average number of vehicles held or to the effective kilometres operated. The capital employed increased quite substantially from Rs. 572 lakhs in 1965-66 to Rs. 3988 lakhs in 1979-80 - an increase of 597 per cent. It may be noted here that the number of

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2 For details see Appendix - IV.

Table 4.1

GENERAL PROGRESS OF KSRTC

Indicators	65-66	70-71	75-76	76-77	77-78	78-79	79-80
Average No. of vehicles held (Index)	805 (100)	1419 (176)	2049 (254)	2284 (284)	2481 (308)	2582 (321)	2748 (341)
Effective Kilometres operated (Lakhs) (Index)	633 (100)	1047 (165)	1783 (282)	2029 (321)	2060 (325)	2128 (336)	2242 (354)
Total Passengers carried(Lakhs) (Index)	1585 (100)	3106 (198)	5183 (327)	5111 (322)	5556 (351)	6328 (399)	7064 (446)
Capital Employed(Rs. in lakhs) (Index)	572 (100)	1164 (203)	2289 (400)	2686 (470)	3029 (530)	3559 (622)	3998 (697)
Total Staff (Index)	6662 (100)	12371 (186)	20805 (303)	21791 (318)	23264 (339)	27751 (404)	N.A.
Total Revenue(Rs. in lakhs) (Index)	631 (100)	1225 (194)	3091 (490)	4042 (641)	4327 (686)	4737 (751)	N.A.
Total Cost (excluding Taxes & depreciation)(Rs. in lakhs) (Index)	439 (100)	1051 (239)	2989 (681)	3329 (758)	3702 (843)	4053 (923)	N.A.

Sources : (1) KSRTC, Annual Administration Reports, various years.

(11) Statistical Section, KSRTC, Trivandrum.

vehicles held did not increase in tune with the capital employed, although vehicles generally account for a major share of the total investment in a transport undertaking. This was probably due to the greater emphasis given to the establishment of bus stations and providing better facilities to the passengers during the seventies.

Of all the indicators listed, the total revenue and total cost registered the highest increase rate. The total cost (excluding taxes and depreciation) increased from 439 lakhs in 1965-66 to 4053 lakhs in 1978-79, while the total revenue increased from 631 lakhs to 4737 lakhs during the same period. Although total revenue exceeded the total controllable costs (excluding taxes and depreciation) throughout the period, the costs increased at a much faster rate than the revenue. While the revenue increased by 651 per cent, the increase in total cost was by 823 per cent.

#### Growth compared to other STUs

Table 4.2 presents some comparative statistics of KBRTC vis-a-vis other selected STUs for 1974-75 and 1978-79 and the rate of growth during the period.<sup>3</sup> The average number of vehicles held increased by 75 % in Andhra Pradesh BRTC followed by 46 % in KBRTC; it was the lowest in Gujarat BRTC.

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3 For details see Appendix V.

Table 4.2

## GENERAL PROGRESS - KARTIC AND OTHER SIDA

Year	Undertaking	Average Ho. of vehicles held	Effective operated	Capital employed	Total Revenue ps/km	Total cost ps/km	Vehicle utili- sation kms/ day	Passen- gers carried per bus per day	Fleet Utili- sation %age	KARTIC ps/ km
1974-75	Kerala	1887	1551	2103	160	143	273	709	78.7	17
	Karnataka	3597	2278	4343	185	147	235	518	77.8	36
	Andhra Pradesh	3225	3091	4319	184	122	307	506	87.0	62
	Gujarat	5466	3750	5371	179	131	270	564	77.3	48
	Maharashtra	7376	6238	7736	202	159	235	357	67.5	43
1979-80	Kerala	2748	2242	3988	235	229	267	847	83.6	6
	Karnataka	4428	3380	7807	262	199	264	508	79.2	63
	Andhra Pradesh	5577	5041	12635	233	184	315	613	92.0	49
	Gujarat	6101	5253	11292	239	164	292	634	80.7	75
	Maharashtra	8766	6705	16541	269	193	250	410	83.6	76
Percent Growth 74-75 to 79-80	Kerala	46	45	90	47	60	(-2)	19	6	(-67)
	Karnataka	23	48	80	42	35	12	17	2	55
	Andhra Pradesh	75	89	193	27	51	3	21	6	(-21)
	Gujarat	12	40	110	34	25	8	12	4	56
	Maharashtra	19	58	114	33	21	5	15	24	77

\* KBIT = Earnings Before Taxes &amp; Depreciation

Source : Compiled from Association of State Road Transport Undertakings, Report on the Performance of National Road Transport Undertakings, 1974-75 and 1979-80, GRTI, Poona.

The total effective kilometres operated which is a measure of the productivity of the vehicles, should normally grow at an increasing rate or at least grow in pace with the growth in the number of vehicles held. This also was the highest in Andhra Pradesh STIC which registered 89 % growth followed by Maharashtra STIC with 58%. The effective kilometres operated in K-STIC increased by 45 % during the same period. More than proportionate increase in effective kilometres in relation to the number of vehicles held shows improved utilisation of the fleet and vehicles. Growth in effective kilometres was roughly three times that of the average number of vehicles in Gujarat and Maharashtra STICs and more than double in Karnataka STIC. As against this, in KSTIC when the average number of vehicles increased by 46 % , the growth in the effective kilometres operated was only 45%. This was also largely corroborated from the analysis of vehicle utilisation and fleet utilisation during this period. The averagedaily utilisation of vehicle showed a moderate increase in all the STUs studied except in K-STIC where it declined from 273 kms in 1974-75 to 267 kms in 1979-80. The fleet utilisation showed a substantial increase in Maharashtra STIC, from 57.5% in 1974-75 to 83.6% in 1979-80. Other STUs showed a moderate growth ranging from 2% in Karnataka STIC to 6% each in Kerala and Andhra Pradesh STICs.

The capital employed increased by 193% in Andhra Pradesh SRTC, 114% in Maharashtra SRTC and 90% in Kerala SRTC during the review period. The huge increase in capital employed in Andhra Pradesh SRTC also explains the high rate of growth in the average number of vehicles and effective kilometres in that undertaking. Although the number of passengers carried daily per bus in 1979-80 varied from 410 in Maharashtra to 847 in KRTC, the rate of growth over 1974-75 in all these undertakings was between 15 - 20 %.

A comparison of the total revenue and total cost in these undertakings during 1974-75 to 1979-80 period shows several interesting features. Among the five STUs analysed, the total revenue and total cost in 1974-75 were the highest in Maharashtra SRTC which earned 202 ps/km and spent 159 ps/km. The total revenue was the lowest in KRTC ( 160 ps/km ) and higher in Gujarat SRTC ( 179 ps/km ). Andhra Pradesh SRTC incurred the lowest total cost ( 122 ps/km ) and slightly higher in Gujarat SRTC ( 131 ps/km ). As against this position, Kerala SRTC incurred the highest total cost of 229 ps/km in 1979-80, registering 60% growth over 1974-75. The total cost was the lowest in Gujarat ( 154 ps/km ) followed by Andhra Pradesh SRTC. The total revenue per kilometre in 1979-80 was the lowest in Andhra Pradesh SRTC ( 233 ps/km ); this was slightly higher in KRTC ( 235 ps/km ).

The per cent increase from 1974-75 to 1979-80, both in respect of total revenue and total cost was the highest in KSRIC. The lowest growth rate in terms of total revenue was noticed in Andhra Pradesh SRTC and that in respect of total cost was in Maharashtra SRTC. In KSRIC and Andhra Pradesh SRTC, the growth rate in total cost was higher than that of the total revenue, while in other three STUs, it was lower than that of total revenue.

It may be observed from the above, that the progress of KSRIC, when analysed by itself in terms of the several indicators, was fairly impressive. But when it is compared with the performance of other STUs, KSRIC is seen to be deficient in several areas. From the profitability point of view, it is important to note that although both cost and revenue in KSRIC increased substantially during the review period, the cost increase far outstripped the revenue increase resulting in a steep fall in earnings before taxes and depreciation. The decline in vehicle utilisation and low growth in effective kilometres operated per vehicle have also contributed to such a state of affairs.

### Materials Management

Materials management function plays a predominant role in determining the overall performance of a public utility

service like K&RTC. The quality of service as indicated by the punctuality, cancellation of trips, breakdowns and accidents and fleet utilisation, are to a large extent closely linked to the proper management of the several hundreds of items required for their maintenance and operation. This involves judicious planning in order to ensure uninterrupted flow of materials in the required quantity and quality, at the right time, and to avoid unnecessary building up of inventory. Efficient materials management will help to reduce the overall cost of purchasing, stocking and utilisation of materials, while at the same time maintaining adequate level of inventory to meet the requirements.

#### Expenditure on materials

In 1978-79 materials and personnel accounted for 91 per cent of the total cost (excluding taxes and depreciation) in K&RTC. The expenditure on materials alone was 46%. In 1965-66, the year of formation of K&RTC, the share of materials in the total cost was 51% and that of personnel 39%. But since 1970-71, the cost of both materials and personnel have averaged around 46% of the total cost. Materials cost as a per cent of total revenue has averaged more or less at 40%. Table 4.3 shows the break-up of total cost and materials cost as per cent of total revenue from 1965-66 to 1978-79.<sup>4</sup>

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<sup>4</sup> See Appendix VI for detailed cost break-up in K&RTC.



**Table 4.3**  
**Proportion of Materials Cost in KSRIC**

Year	Materials (as % of total cost and depreciation)	Personnel	Others	Materials cost as per cent of total revenue
1965-66	51	39	10	36
1970-71	46	46	8	40
1975-76	46	47	7	44
1976-77	47	44	9	40
1977-78	48	45	7	41
1978-79	46	45	9	40

Source : (1) KSRIC, Annual Administration Report, various years.

(ii) Statistical section, KSRIC, Trivandrum.

Table 4.4 presents materials cost as per cent of total cost and total revenue in different STUs including KSRIC, for 1974-75, 1978-79 and 1979-80. In 1974-75, materials cost as a per cent of total cost ranged from 47 % in KSRIC to 54 % in Andhra Pradesh SRTC. In 1978-79 materials cost percentage in the same group of undertakings varied from 41 % in Karnataka SRTC to 48 % in Maharashtra SRTC. In KSRIC it declined to 46 %. Material cost percentages in other STUs varied from as low as 30 % in BEST Undertaking to 54 % in Haryana ST. Comparison of materials cost in KSRIC vis-a-vis other undertakings for the year 1978-79 shows that 4 STUs out of the 11 undertakings analysed, have the materials cost percentage higher than that of KSRIC. In 1979-80 both KSRIC and Gujarat

**Table 4.4**  
**Proportion of Materials Cost**  
**in different STUs**

Year	Undertaking	Materials cost as per cent of total cost	Materials cost as per cent of total revenue
1974-75	Kerala SRTC	47	42
	Karnataka SRTC	49	39
	Andhra Pradesh SRTC	54	36
	Gujarat SRTC	48	35
	Maharashtra SRTC	50	39
1978-79	Kerala SRTC	46	40
	Karnataka SRTC	41	33
	Andhra Pradesh SRTC	47	37
	Gujarat SRTC	42	29
	Maharashtra SRTC	48	32
	MST, Bombay	30	26
	DTC, Delhi	33	52
	Haryana S.T.	54	44
	Rajasthan RTC	52	48
	Bihar RTC	40	37
Pallavan TGL(Metro)	44	35	
1979-80	Kerala SRTC	44	41
	Karnataka SRTC	51	39
	Andhra Pradesh SRTC	49	39
	Gujarat SRTC	44	30
	Maharashtra SRTC	49	35

Source : Compiled from Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1974-75, 1978-79 and 1979-80, CIRT, Poona.

SRTC showed the lowest percentage of material cost among the sample undertakings.

Although comparisons based on the revenue earned in different STUs tend to become misleading because of the wide

variations in fare structure and taxes, analysis of the materials cost as a per cent of total revenue indicates what portion of the revenue earned is spent on materials. In 1974-75 KERTC spent 42 % of the revenue on materials which was the highest among the five undertakings under comparison followed by Karnataka and Maharashtra SRTCs. Gujarat SRTC with only 35 % was at the lowest. KERTC continued to have the highest ratio in 1978-79 and 1979-80. Gujarat SRTC again indicated the lowest percentages in both the years.

If other large STUs are also considered, materials cost as a per cent of total revenue varied from as low as 26 % in BEST Undertaking to 52 % in Delhi Transport Corporation. It is interesting to note that both these undertakings operate, almost exclusively city services in two major metropolitan areas in the country. Out of the eleven undertakings analysed in 1978-79 only three STUs spent a higher percentage of revenue on materials than KERTC. Further analysis confirms this.

#### Material cost break-up

It is important to examine the various components of the material cost and their behaviour over the years, vis-a-vis the number of vehicles held and the effective kilometres operated. This is shown in Table 4.5.<sup>5</sup>

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<sup>5</sup> For details see Appendix VI

**Table 4.5**  
**Materials Consumption in KSRTC**

( Rupees in lakhs )

Sl. No	Particulars	65-66	70-71	75-76	76-77	77-78	78-79
1.	Spare parts (Index)	22.1 (100)	85.8 (388)	178.4 (807)	258.2 (1168)	283.5 (1283)	332.3 (1504)
2.	Tyres & Tubes (Index)	48.6 (100)	113.9 (234)	374.3 (770)	394.6 (812)	431.4 (888)	467.3 (962)
3.	Lubricants (Index)	7.0 (100)	19.7 (281)	102.8 (1468)	110.6 (1580)	115.3 (1647)	122.9 (1756)
4.	Batteries (Index)	2.9 (100)	6.3 (217)	30.1 (1038)	21.4 (738)	55.0 (1895)	13.6 (459)
5.	Fuel (Index)	12.2 (100)	232.2 (193)	610.9 (508)	746.3 (621)	782.1 (651)	836.7 (696)
6.	Other stores	23.4	28.8	73.2	78.4	98.3	98.0
7.	Total stores (Index)	224.2 (100)	486.7 (217)	1369.7 (611)	1609.5 (718)	1765.6 (788)	1870.8 (834)
8.	Average number of vehicles held (Index)	805 (100)	1419 (176)	2049 (254)	2284 (284)	2481 (308)	2582 (321)
9.	Effective kms. operated (Index)	633 (100)	1047 (165)	1783 (282)	2029 (321)	2050 (325)	2128 (336)

Sources : (i) KSRTC, Annual Administration Reports, various years.

(ii) Statistical section, KSRTC, Trivandrum.

The expenditure on fuel which alone accounted for 45% of the total stores consumption in 1978-79 increased from Rs. 120.2 lakhs in 1965-66 to Rs. 836.7 lakhs in 1978-79, registering 596% growth during this period. But the highest percentage increase was noticed in lubricants followed by spare parts. The expenditure on lubricants and oils increased by 1656 % during the review period. Expenditure on spare parts which accounted for nearly 25 % of the total cost, increased by 1404 % during the same period.

The growth in the expenditure of stores cannot be analysed in isolation without relating it to the number of vehicles held and the effective kilometres operated which will directly influence the absolute value of the stores consumed. While the average number of vehicles held by the Corporation increased by 221 % and the effective kilometres operated increased by 236 %, the expenditure on total stores increased by 734%. The growth in the expenditure on lubricants and spareparts far exceeded the increase in the number of vehicles held as well as the distance operated. The tremendous increase in the expenditure on stores may be attributed mainly to the price escalation of materials and increase in the actual consumption of stores per vehicle and per kilometre.

### Materials consumption per bus

The cost of materials per bus in KSEHC, together with the index of growth vis-a-vis fleet utilisation, vehicle utilisation and percentage of vehicles 10 years and above are given in Table 4.6. The effect of the growth in the average number of vehicles held on the absolute consumption figures has been neutralised by presenting the consumption data on per bus basis.

The consumption of spareparts per bus increased steadily from Rs. 2745 in 1965-66 to Rs. 6047 in 1970-71 and to Rs. 12,869 in 1978-79, an increase of 369% over the consumption in 1965-66. The percentage increase in the consumption of tyres and tubes was only 200 % during this period. The consumption of fuel increased from Rs. 14932 per bus in 1965-66 to Rs. 32,673 in 1976-77 and then declined to Rs. 31,524 in 1977-78. This drop in fuel consumption per bus may be explained by the substantial reduction in vehicle utilisation and fleet utilisation during this period, both having a direct effect on the amount of fuel used. The total stores consumption per bus increased by 160 % from Rs. 27,853 in 1965-66 to Rs. 72,450 in 1978-79.

**Table 4.6**  
**Materials Consumption per bus - KSRTC**

		( Rupees )					
Sl. No.	Particulars	65-66	70-71	75-76	76-77	77-78	78-79
1.	Spare parts (Index)	2745 (100)	6047 (220)	8707 (317)	11302 (412)	11427 (416)	12869 (466)
2.	Tyres & Tubes (Index)	6037 (100)	8026 (133)	18267 (303)	17278 (286)	17388 (288)	18097 (300)
3.	Lubricants (Index)	874 (100)	1386 (159)	5017 (574)	4842 (554)	4647 (532)	4758 (544)
4.	Batteries (Index)	360 (100)	444 (123)	1469 (408)	938 (261)	2217 (616)	527 (146)
5.	Fuel (Index)	14932 (100)	16362 (110)	29815 (200)	32673 (219)	31524 (211)	32406 (217)
6.	Other stores	2905	2028	3572	3431	3952	3793
7.	Total stores (Index)	27853 (100)	34293 (123)	66847 (240)	70464 (253)	71165 (256)	72450 (260)
8.	Fleet utilisation	89.3	86.7	83.8	86.3	84.0	83.9
9.	Vehicle utili- sation.kms/day	238	233	284	282	271	269
10.	percentage of vehicles 10 yrs. and above	14.6	23.6	20.5	22.0	24.5	28.0

Source : Estimates based on data obtained from Annual Administration Reports and Statistical section, KSRTC, Trivandrum.

Fleet utilisation showed a declining trend during the review period. From 89.3 % in 1965-66 it came down to 83.9 % in 1978-79. Although there was some improvement in 1976-77, the trend was clearly a decreasing one. Vehicle utilisation as well as percentage of old vehicles increased during the same period. Vehicle utilisation which is a measure of the daily average distance operated by a vehicle increased from 238 kms/day in 1965-66 to 294 kms/day in 1975-76 and then dropped to 269 kms/day in 1978-79. The percentage of vehicles 10 years and above increased substantially from only 14.6 % in 1965-66 to 28 % in 1978-79.

It can be normally expected that the consumption of stores per bus would have a positive correlation with fleet utilisation, vehicle utilisation and percentage of old vehicles. An increase in the age of vehicles will result in higher consumption of stores, particularly spare parts, because of the more frequent repairs and replacements required. Fuel consumption may also increase with old vehicles. But it is difficult to establish the exact nature of the cause-effect relationship between stores consumption and fleet and vehicle utilisation. It may be argued that improved availability of the right kind of spare parts and other materials will reduce the vehicle downtime due to breakdowns and maintenance, resulting in higher utilisation of the fleet and vehicles. Increased



utilisation of vehicles, in turn can be expected to result in higher consumption of fuel and lubricants per bus. Incidentally it may be mentioned that scheduling is the most important factor which determines the vehicle utilisation, although other factors like breakdowns and condition of the vehicles also influence it.

During the period under review, there was a decline in fleet utilisation and increase in the vehicle utilisation and the percentage of old vehicles in the fleet. The cost of various stores items have also increased substantially at varying rates during the period. This is partly reflected in the value of consumption per bus. The cumulative effect of these changes on the consumption of total stores or its various components is rather difficult to ascertain. Hence comparison of stores consumption per bus in KERTC with other similar STUs will give a more clear picture.

#### Materials consumption per bus in different STUs

Consumption of materials per bus in different STUs for the periods 1974-75, 1978-79 and 1979-80 is given in Table 4.7. The consumption of total stores in 1974-75 was the highest in Andhra Pradesh BRTC ( Rs. 63,010 ) followed by KERTC (Rs.55,142). The consumption figures in Karnataka, Gujarat and Maharashtra BRTCs were approximately between Rs. 42,000 and Rs. 46,000 per bus

**Table 4.7**  
**Materials Consumption per bus in**  
**different States**

( Rupees )

Year	Undertaking	Spare parts	Tyres & Tubes	Fuel & Lubricants	Others	Total
1974-75	Kerala SRTC	6498	12865	30501	5278	55142
	Karnataka SRTC	4186	12450	22615	6563	46014
	Andhra Pradesh SRTC	13215	14308	31893	3594	63010
	Gujarat SRTC	6125	11637	21112	4576	43452
	Maharashtra SRTC	4775	12107	19800	8692	45174
1978-79	Kerala SRTC	12869	18097	37164	4320	72450
	Karnataka SRTC	6098	18287	31619	645	56649
	Andhra Pradesh SRTC	15670	22498	37674	2654	78496
	Gujarat SRTC	7903	12932	29281	5422	55538
	Maharashtra SRTC	10745	18320	28131	6046	63242
	BEST, Bombay	12564	12853	35768	1304	63589
	DTC, Delhi	14841	11039	28586	557	55023
	Haryana ST	18718	13332	38938	-	70988
	Rajasthan SRTC	8178	14992	28621	13629	65420
	Bihar SRTC	6928	7805	19390	20995	55118
Pallavan TOL, Madras	14961	9561	31716	4086	60324	
1979-80	Kerala SRTC	12975	18769	40149	3346	75239
	Karnataka SRTC	7274	20907	36036	12182	76399
	Andhra Pradesh SRTC	18718	25295	44664	4873	93550
	Gujarat SRTC	7655	16429	32514	5003	61601
	Maharashtra SRTC	10372	20806	31981	9776	72935

Source : Estimates based on data obtained from Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertaking 1974-75, 1978-79 and 1979-80, CIRT, Poona.

The consumption of the different components of total stores also followed more or less the same pattern. The consumption per bus of spare parts, tyres and tubes, fuel and lubricants was the highest in Andhra Pradesh SRTC, followed by KSHIC during the year 1974-75.

The comparative analysis of stores consumption per bus in different STUs largely neutralises the effect of cost hike as it will be experienced in the same way by all the undertakings. However, the influence due to several factors including the utilisation of fleet and vehicles and the age of fleet must be considered while comparing the figures for different undertakings. Table 4.8 presents these data for the five undertakings for the period 1974-75 and 1978-79. There is apparently a close relationship between the consumption of stores in 1974-75 and the utilisation of fleet and vehicles and the age of fleet in these undertakings. Fleet utilisation and vehicle utilisation were the highest in Andhra Pradesh SRTC followed by KSHIC which was consistent with the pattern of materials consumption. The proportion of old vehicles in KSHIC (21.6%) was substantially higher than the proportion of vehicles with comparable age in other undertakings. The figures for Andhra Pradesh SRTC were not available. Gujarat and Maharashtra SRTCs which had the lowest level of total stores

**Table 4.8**  
**Utilisation of fleet, vehicles and age of fleet**

Year	Indicators	Kerala	Karnataka	Andhra Pradesh	Gujarat	Maharashtra
1974-75	1. Fleet utilisation	78.7	77.8	87.0	77.3	67.5
	2. Vehicle utilisation kms/day	273	235	307	270	235
	3. Percent of vehicles 10 years and above	21.6%	-	-	-	-
	4. Percent of vehicles 7 lakh kms & above	-	12%	N.A.	4%	5.2%
1978-79	1. Fleet utilisation	83.9	78.0	87.9	79.9	82.7
	2. Vehicle utilisation kms/day	269	264	315	292	250
	3. Percent of vehicle 10 years & above	28.0	-	-	-	-
	4. Percent of vehicles 7 lakh kms. & above.	-	15.7%	N.A.	N.A.	N.A.

**Note :** The life of a bus can be expressed either in years or in running kilometres. Ten years life is approximately equal to seven lakh kilometres.

**Source:** Estimates based on data obtained from Annual Administration Reports of the respective undertakings.

consumption 1974-75 also had the lowest percentage of fleet utilisation and proportion of old vehicles. In respect of vehicle utilisation, Maharashtra SRTC and Karnataka SRTC had the lowest rate, followed by Gujarat SRTC. Hence it can be concluded that the relatively high levels of stores consumption in KSRTC during 1974-75 does not necessarily indicate any abnormal consumption pattern, but it is perhaps only a reflection of the higher average age of vehicles and the increased vehicle utilisation.

The materials consumption per bus during 1978-79, shown in table 4.7 gives data regarding the different STUs including some city service undertakings. Among these STUs, Andhra Pradesh SRTC shows the highest consumption of total stores per bus (Rs. 78,496) followed by KBRTC (Rs. 72,450). Delhi Transport Corporation, Bihar SRTC and Gujarat SRTC showed the lowest rate of consumption - approximately Rs. 55,000/bus. Out of the 11 undertakings compared, only four STUs have consumption of spare parts per bus more than that of KSRTC. Similarly there are only three undertakings with higher consumption of tyres and tubes and only two undertakings with higher consumption of fuel and lubricants than KSRTC.

As in 1974-75, the fleet utilisation and vehicle utilisation in 1978-79 were also the highest in Andhra Pradesh SRTC.

KSRTC stood second in fleet utilisation and third in vehicle utilisation. But there was a phenomenal increase in the proportion of old vehicles in KSRTC, from 21.6% in 1974-75 to 28 % in 1978-79. This is shown in Table 4.8.

Andhra Pradesh SRTC continued to have the highest level of total stores consumption/bus ( Rs.93,550 ) in 1979-80, followed by Karnataka SRTC ( Rs. 76,399 ) and KSRTC (Rs.75,239). Analysis of the growth in total stores consumption among the sample STUs from 1974-75 to 1979-80 shows that Karnataka SRTC had the highest increase in materials consumption (66%) followed by Maharashtra SRTC (61%). KSRTC had the lowest per cent increase of 36%.

#### Materials consumption per kilometre

The above analysis of the materials consumption per bus in different STUs suffers from one important shortcoming. If the utilisation of fleet and vehicles varies considerably among the STUs compared, this analysis may not present an accurate picture of the performance of the undertakings concerned. This is because undertakings with low utilisation of fleet and vehicles will also usually have low levels of materials consumption per bus, as against undertakings with high levels of utilisation. This effect can be neutralised by presenting the data on the basis of stores consumption per kilometre.

Materials consumption per kilometre in K&SRTC, with index of increase from 1965-66 to 1979-80, is presented in Table 4.9. It shows that the consumption of total stores increased from 35.4 ps/km to 92.2 ps/km during this period, registering 260% increase. The percentage of increase was the highest for lubricants (382%), followed closely for spare-parts (354%). The cost of spare parts increased steadily from 3.5 ps/km in 1965-66 to 15.9 ps/km in 1979-80.

The increase in the consumption of materials (paise per kilometre) can be attributed, as noted earlier, to two major factors: namely increase in the cost of inputs and increase in the absolute quantity of materials consumed. Although it is difficult to isolate the influence of these and other factors on the increase in materials consumption, it is possible to compare it with the general price trends of such materials and with the pattern of growth in other STUs.

Table 4.10 shows the cost hike in materials for all STUs from 1972-73 to 1979-80. Tyres and tubes registered the maximum increase of 140% followed by fuel and lubricants (74%). The percentage increase was the lowest for spare-parts (30%). The cost of total stores increased by 75% during the same period. The relative proportion of spareparts and tyres and tubes in the total cost also underwent significant changes, as may be observed from the table.

**Table 4.9**  
**MATERIALS CONSUMPTION PER KILOMETRE - KSRTC**

( Pa/km )

Sl No	Items	65-66	70-71	75-76	76-77	77-78	78-79	79-80
1.	Spare parts (Index)	3.5 (100)	8.2 (234)	10.0 (286)	12.7 (363)	13.8 (394)	15.6 (446)	15.9 (454)
2.	Tyres & tubes (Index)	7.7 (100)	10.9 (142)	21.0 (273)	19.5 (253)	20.9 (271)	22.0 (286)	23.0 (299)
3.	Lubricants (Index)	1.1 (100)	1.9 (173)	5.8 (527)	5.5 (500)	5.6 (509)	5.8 (527)	5.3 (482)
4.	Batteries	0.5	0.6	1.7	1.1	2.7	0.6	1.1
5.	Fuel (Index)	19.0 (100)	22.2 (117)	34.3 (181)	35.8 (194)	37.9 (199)	39.3 (207)	43.9 (231)
6.	Other stores	3.7	2.8	4.1	3.9	4.8	4.6	3.0
7.	Total stores (Index)	35.4 (100)	45.5 (131)	76.9 (217)	79.3 (224)	85.7 (242)	87.9 (248)	92.2 (260)

Source : Estimates based on data obtained from Annual Administration Reports and Statistical Section, KSRTC, Trivandrum.

The cost hike in materials in KSRTC during the same period, i.e. from 1972-73 to 1979-80 is presented in Table 4.11. According to this the largest hike was in tyres and tubes (137%), followed by fuel and lubricants (79%) and spare parts (49%). The relative share of the different cost components also changed during the period, in a manner similar to the general pattern indicated in Table 4.10.



**Table 4.10**  
**Cost Hike in Materials at a Glance**

Sl No	Items	72-73 ps/km	Percent- age to total	79-80 ps/km	Percent- age to total	Percent Increase
1	Spare parts	10.6	20	13.8	15	30
2	Tyres & tubes	9.6	19	23.2	26	140
3	Fuel and Lubricants	25.5	50	44.4	50	74
4	Others	5.7	11	8.3	9	45
<b>Total</b>		<b>51.4</b>	<b>100</b>	<b>89.7</b>	<b>100</b>	<b>75</b>

Source : Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1978-79 and 1979-80, CIRT, Poona.

**Table 4.11**  
**Cost Hike in KSTTC**

Sl No	Items	72-73 ps/km	Percent- age to total	79-80 ps/km	Percent- age to total	Percent Increase
1	Spare parts	10.7	20	15.9	17	49
2	Tyres & tubes	9.7	19	23.0	25	137
3	Fuel & Lubricants	27.5	53	49.2	53	79
4	Others	4.4	8	4.1	5	(-7)
<b>Total</b>		<b>52.3</b>	<b>100</b>	<b>92.2</b>	<b>100</b>	<b>76</b>

Source : Estimates based on data obtained from Annual Administration Reports and Statistical section, KSTTC, Trivandrum.

Comparison of the cost hike in KBRIC with the general trend for all STUs ( Table 4.10) shows that KBRIC closely followed the general pattern except in the case of spareparts and other stores. This is given in Table 4.11 The cost of spareparts in KBRIC increased by 49% while the average rise in all STUs was only 30% during the period. On further analysis it is observed that the increase in the cost of spareparts in KBRIC from 1970-71 to 1979-80 is substantially higher than the 49% increase observed during 1972-73 to 1979-80. During 1970-71 to 1979-80 the hike in spareparts cost in KBRIC was 94% and during 1975-76 to 1979-80 it was 59%, both of which were significantly higher than the general pattern indicated.

The possible reasons for such an increase in consumption may include the following :

- higher consumption of spareparts due to increase in the proportion of old vehicles.
- more than proportionate consumption of spareparts due to changed maintenance policies.
- consumption of spareparts during 1970-71 to 1974-75 period was on the lower side (in comparison with other STUs) which might have been corrected during the recent years by gearing up maintenance.

Cost of other stores in KBRIC also exhibited significant deviation from the general pattern. It declined by 7% while

the general trend showed 45% increase. This can be explained from the fact that cost of other stores has not exhibited any consistent pattern as may be observed from Table 4.9. One possible reason for this could be the lack of a clear definition of other stores and as a result it may include all miscellaneous items not mentioned elsewhere.

#### Materials consumption per kilometre in various STUs

Data regarding the consumption of materials per kilometre in different STUs is given in Table 4.12.<sup>6</sup> In the year 1974-75 the consumption of total stores among the five STUs varied from 53.3 ps/km in Gujarat SRTC to 78.6 ps/km in Maharashtra SRTC while in KSRIC it was 57.1 ps/km. The consumption of spareparts per kilometre was the lowest in Karnataka SRTC followed by MSRTC. It was the highest in Andhra Pradesh SRTC. The consumption of fuel and lubricants per kilometre was the highest in KSRIC ( 37.1 ps/km ), followed by Karnataka SRTC (35.7 ps/km ). Gujarat SRTC had the lowest consumption of fuel and lubricants. Consumption of tyres and tubes was the lowest in Andhra Pradesh SRTC followed by MSRTC. This shows that the consumption of materials in MSRTC was fairly low when compared to the other sample STUs. The cost of materials excluding fuel and lubricants was the lowest in KSRIC ( 30 ps/km ) in 1974-75.

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6 For details see Appendix - V.

**Table 4.12**  
**Materials Consumption per kilometre**  
**in different STUs**

		( ps/km )				
Year	Undertaking	Spare parts	Tyres & Tubes	Fuel & Lubricant	Others	Total
1974-75	Kerala SRTC	7.9	15.7	37.1	6.4	67.1
	Karnataka SRTC	6.6	19.7	35.7	10.7	72.7
	Andhra Pradesh SRTC	13.8	14.9	33.3	3.8	65.8
	Gujarat SRTC	8.9	17.0	30.8	6.7	63.3
	Maharashtra SRTC	8.3	26.1	34.5	14.8	78.6
1978-79	Kerala SRTC	15.6	22.0	45.1	5.2	87.9
	Karnataka SRTC	8.2	24.7	42.6	0.9	76.4
	Andhra Pradesh SRTC	16.2	23.2	38.9	2.7	81.1
	Gujarat SRTC	9.5	15.5	35.1	6.5	66.5
	Maharashtra SRTC	14.3	24.3	37.4	8.0	84.0
	BEST Bombay	17.4	17.7	30.5	1.8	67.3
	DTC Delhi	24.0	17.8	45.2	0.9	88.9
	Haryana ST	21.2	15.1	44.1	-	80.4
	Rajasthan RTC	12.0	22.0	42.0	20.0	96.0
	Bihar RTC	14.9	16.7	41.6	0.5	73.6
Pallevan TCL(Metro)	22.2	14.2	47.0	6.1	89.5	
1979-80	Kerala SRTC	15.9	23.0	49.2	4.1	92.2
	Karnataka SRTC	9.5	27.4	47.2	16.0	100.1
	Andhra Pradesh SRTC	13.1	24.5	43.3	4.7	90.6
	Gujarat SRTC	8.0	19.1	37.8	5.8	71.5
	Maharashtra SRTC	13.6	27.2	41.8	12.8	95.4

Source : Compiled from Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1974-75, 1978-79 and 1979-80, C.M.T., Poona.

The consumption of total stores per kilometre was found to vary considerably among the different STUs in 1978-79. The range was from 66.5 ps/km in Gujarat SRTC to 95 ps/km in Rajasthan SRTC. The total stores consumption in KSRIC was 87.9 ps/km. There were only three other undertakings among the 11 compared, with a higher rate of consumption. The consumption of spareparts varied from 8.2 ps/km in Karnataka SRTC to 24 ps/km in Delhi Transport Corporation. Significant variations among the undertakings were observed in the consumption of fuels and lubricants, tyres and tubes and other materials also.

Among the five undertakings, the consumption of total stores was the highest in KSRIC (87.9 ps/km) followed by Maharashtra SRTC (84 ps/km). The consumption of fuels and lubricants in KSRIC in 1978-79 was significantly higher than all other STUs in the sample. The consumption of spareparts was the highest in Andhra Pradesh SRTC (16.2 ps/km) closely followed by KSRIC (15.6 ps/km).

In 1979-80 the consumption of total stores was the highest in Karnataka (100.1 ps/km) and the lowest was in Gujarat SRTC (71.5 ps/km). The consumption of KSRIC was 92.2 ps/km. The consumption of spareparts per kilometre in 1979-80 increased by 101 % in KSRIC, over the 1974-75 figures. This was considerably higher than in all the other undertakings analysed.

### Consumption of fuel

Fuel is the most important component of the total materials cost in any transport undertaking. Cost of fuel alone accounted for 48% of the total materials cost in KERTC in 1979-80. The position is not much different in other undertakings. Hence any attempt to control materials cost in STUs must, first of all, focus attention on the consumption of fuel.

The rate of consumption of fuel indicated by the average number of kilometres operated with one litre of fuel among the different undertakings, for the periods 1975-76 and 1979-80 is given in Table 4.13. It shows that among these undertakings KERTC had the highest fuel consumption rate, i.e. lowest distance per litre ( 3.80 kms/litre ) followed by Karnataka SRTC ( 3.94 kms/litre ). Gujarat SRTC obtained the maximum distance per litre ( 4.64 kms/litre ). Another important observation from this table is that the fuel performance of KERTC deteriorated during the period 1975-76 to 1979-80, while all other STUs in the sample improved their performance.

In order to facilitate comparison with a larger number of STUs, Table 4.14 presents a broad classification of 34 major undertakings on the basis of their fuel performance. It shows that in five undertakings the rate of consumption was 4.20 or more kms/litre. In five others this was 3.40

**Table 4.13**  
**Fuel Consumption in different Undertakings**

( kms per litre )

Undertaking	1975-76	1979-80
Kerala SRTC	3.95	3.80
Karnataka SRTC	3.92	3.94
Andhra Pradesh SRTC	4.02	4.18
Gujarat SRTC	4.35	4.64
Maharashtra SRTC	3.87	4.18

Source : Compiled from Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1975-76 and 1979-80, CIRT, Poona.

**Table 4.14**  
**Fuel Performance of STUs - 1979-80**

Kms per litre	Undertaking
4.20 and above	Bihar SRTC, Gujarat SRTC, Orissa SRTC, Uttar Pradesh SRTC, Orissa RT Co. Ltd.
4.00 to 4.20	Andhra Pradesh SRTC, Maharashtra SRTC, Madhya Pradesh SRTC, Rajasthan SRTC, Thiruvalluvar TGL, Nagaland ST, Bombay Metro TGL.
3.80 to 4.00	Karnataka SRTC, Kerala SRTC, Anna TGL, Pallavan TGL (Dist), Haryana ST, Sikkim MT, Kolhapur MTU.
3.60 to 3.80	North Bengal STC, Pepsu RTC, Tripura RTC, Cheran TGL, Cholan RWCL, Kattabomman TGL, Punjab ST, Ahmedabad MTU, Pallavan TGL (Metro), Delhi TC.
3.40 to 3.60	Pandiyan TGL, Manipur SRTC, Pune MT.
3.20 to 3.40	NIL.
3.00 to 3.20	Himachal RTC
Below 3.00	BESI Undertaking.

Source : Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1978-79 and 1979-80, CIRT, Pune.

or less kms/litre. The median of the distribution falls in the category of 3.80 - 400 kms/litre. KSRTC with 3.80 kms/litre is just at the bottom of the median group. However, KSRTC cannot feel complacent about this position since most of the undertakings with a lower kms/litre (less than 3.80 kms/litre) are either city transport services like B.E.T., DTC, PWT, Ahmedabad Municipal Transport, etc. or they operate mainly in hilly areas like Himachal SRTC, Manipur SRTC, Tripura SRTC, etc. where the fuel consumption is bound to be higher. Higher rate of fuel consumption may be explained by the age and condition of the vehicles, the nature of the terrain where services are operated or inadequate attention to consumption of fuel in driving.

#### Cost on tyres and tubes

Cost on tyres and tubes forms the second major component of the total materials cost in STUs. In 1979-80 the expenditure on tyres and tubes alone accounted for 25 % of the total expenditure on materials in KSRTC. Fuel and tyres and tubes, the two major components, together controlled 73 % of the total cost on materials in KSRTC. This explains their crucial importance.

The performance of new tyres as well as retreaded tyres in different undertakings during 1979-80 is given in Table 4.15. The data shows wide variation in tyre



**Table 4.15**  
**Tyre Performance in different Undertakings**

Undertakings	1979 - 80	
	New Tyre (Kms)	Retreaded (Kms)
Kerala	22418	15068
Karnataka	31303	14672
Andhra Pradesh	33855	19491
Gujarat	51000	20700
Maharashtra	34634	15524
BRST, Bombay	33786	20434
DTC, Delhi	34777	25379
Haryana ST(78-79)	57301	40282
Rajasthan RTC	29053	13899
Bihar RTC	40608	38185
Pallavan TCL(Metro)	35182	21664

Source : Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1978-79 and 1979-80, CRT, Poona.

performance among these undertakings. The performance of new tyres was found to be the lowest in KSRIC ( 22418 kms ) and the highest in Haryana ST ( 57301 kms in 1978-79 ) followed by Gujarat SRIC ( 51000 kms ). The average performance of new tyres for all the 11 undertakings listed is 36720 kms about 14300 kms higher than that of KSRIC. The performance retreaded tyres is also poor in KSRIC. Only two STUs, namely Karnataka SRIC and Rajasthan SRIC have the retreaded tyre

kilometres lower than K&RTC. The average performance of retreaded tyres for the 11 undertakings is 22391 kms., about 7300 kms higher than that of K&RTC ( 15068 Kms ).

Table 4.16 presents the classification of 30 major undertakings on the basis of cost on tyres and tubes per kilometre 1979-80. It can be observed that K&RTC and Andhra Pradesh SRTC spend approximately 23 to 25 ps/km on tyres and tubes. Among the sample STUs only Gujarat SRTC has a lower cost on tyres and tubes (17 to 20 ps/km).

Table 4.16

Cost on Tyres and tubes in different STUs - 1979-80

Cost paise per km.	Undertakings
Less than 14	Poona MT, Ahmedabad MT.
14 to 17	Pepsu RTC, U&PRTC, Thiruvalluvar, TGL, Baryana ST, Punjab ST, Pallavan ICL (Metro).
17 to 20	Gujarat SRTC, North Bengal SRTC, Bihar SRTC, Cholan RWCL, Kattabomman ICL, Pandiyan RWCL, Orissa RTCL, Pallavan ICL (Dist), Delhi TC.
20 to 23	MPCRTC, Cheran ICL, BSST Undertaking.
23 to 25	APRTC, Kerala SRTC, Kolhapur MT.
25 to 30	Karnataka SRTC, Maharashtra SRTC, Rajasthan SRTC, Orissa SRTC.
More than 30	Himachal SRTC (34) Calcutta RTC (43.26)
Abnormal	Tripura RTC ( 61.83 )

Source : Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1978-79 and 1979-80, CIRT, Poona.

It can be observed that from among the 30 undertakings listed, 20 STUs incurred a lower cost on tyres and tubes than KSRIC, while only 7 STUs incurred a higher cost. Among these 7 undertakings, two STUs namely Himachal SRTC and Tripura SRTC operate mainly in hilly areas where the cost is likely to be higher. This shows that the expenditure on tyres and tubes in KSRIC is on the higher side in relation to other comparable undertakings.

The foregoing discussion and analysis of the materials consumption in KSRIC and in other undertakings relate only to the cost of various inputs as shown in the balance sheet. Besides this, there are several costs involved in procuring, stocking ( or not stocking ) and distributing the materials. Some of them are hidden costs which are difficult to identify and estimate. But all these costs must be considered while devising methods for the proper management of materials in any undertaking. Scientific inventory management envisages stocking the right quantity of the right type of materials for efficient operation of the services by adopting various inventory management techniques.

#### Inventory holdings in KSRIC

The growth of total stores inventory in KSRIC showed an erratic pattern during the period 1965-66 to 1978-79 as may be observed from Table 4.17.

**Table 4.17**  
**INVENTORY HOLDINGS IN KARTIC AT THE END OF MARCH**

( Rupees in lakhs )

Sl No	Particulars	1966	1971	1976	1977	1978	1979
1.	Spare parts (Index)	46.4 (100)	82.0 (177)	79.5 (171)	44.7 (96)	100.0 (216)	101.6 (219)
2.	Tyres and tubes (Index)	3.3 (100)	13.5 (409)	8.2 (248)	5.6 (170)	8.9 (270)	15.6 (473)
3.	Lubricants	1.9	4.1	5.8	2.3	0.9	1.7
4.	Fuel	1.6	1.8	3.6	3.1	3.5	3.5
5.	Other stores (Index)	22.6 (100)	21.4 (95)	39.1 (173)	24.6 (109)	29.5 (131)	28.3 (125)
6.	Total stores (Index)	75.8 (100)	122.8 (162)	136.2 (180)	80.3 (106)	142.8 (188)	150.7 (199)
7.	Average number of vehicles held	805	1419	2049	2284	2481	2582
8.	Effective kms. performed (lakhs) (Index)	633 (100)	1047 (165)	1783 (282)	2029 (321)	2060 (325)	2128 (336)

Note : Other stores include batteries also.

Source : (i) KARTIC, Annual Administration Reports, various years.

(ii) Statistical Section, KARTIC, Trivandrum.

The total value of inventory at the end of March 1966 was Rs. 75.8 lakhs, which shot up to Rs. 122.8 lakhs at the end of March 1971 and to Rs. 136.2 lakhs at the end of March 1976. But at the end of March 1977 the inventory level sharply declined to Rs. 80.3 lakhs and again increased to Rs. 150.7 lakhs at the end of March 1979. The percentage of increase from 1965-66 to 1978-79 was 99 %. The number of buses held by the Corporation on the other hand had increased by 221 % and

the effective kilometres operated by 236 % during the period, bringing down the amount of inventory held per bus and per kilometre.

The spareparts inventory which alone accounted for more than 67 % of total stores at the end of 1978-79 increased by 119% during the review period. The share of spareparts in the total inventory averaged about 63 % during 1965-66 to 1978-79. Although the growth in the inventory of tyres and tubes was more than three times that of spareparts, violent fluctuations were noticed from year to year in the inventory levels of tyres and tubes.

The inventory holdings in K&RTC at the end of March 1966 to 1979 are furnished in Table 4.17.<sup>7</sup>

#### Inventory holdings per bus in K&RTC

Inventory holdings per bus in K&RTC is given in Table 4.18. It may be observed from the table that the total inventory holdings per bus decreased substantially from Rs. 9403.8 at the end of 1965-66 to Rs. 5835.3 at the end of 1978-79, a reduction of 38 %. The inventory of spare parts per bus decreased by 32 % during the same period. It can be

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7 For further details see Appendix VII.

**Table 4.18**  
**Inventory Holdings per Bus - KSRTC**

( Rupees )

<b>Sr No</b>	<b>Particulars</b>	<b>65-66</b>	<b>70-71</b>	<b>75-76</b>	<b>76-77</b>	<b>77-78</b>	<b>78-79</b>
1.	Spare parts (Index)	5759.0 (100)	5778.7 (100)	3879.9 (67)	1954.9 (34)	4030.6 (70)	3934.9 (68)
2.	Tyres and tubes (Index)	405.0 (100)	951.4 (235)	400.2 (99)	243.0 (60)	358.7 (89)	602.6 (149)
3.	Lubricants	234.8	289.6	283.1	102.0	36.3	67.0
4.	Batteries	-	-	53.7	68.7	24.2	23.2
5.	Fuel	202.5	128.3	175.7	136.2	141.1	134.0
6.	Other stores (Index)	2802.5 (100)	1508.1 (54)	1854.6 (66)	1008.8 (36)	1164.9 (42)	1073.6 (38)
7.	Total Stores (Index)	9403.8 (100)	8656.1 (92)	6647.2 (71)	3513.6 (37)	5755.8 (61)	5835.3 (62)
8.	Percent of vehicles 10 years and above	14.6	23.6	20.5	22.0	24.5	28.0
9.	Fleet utilisation	89.3	86.7	83.8	86.3	84.0	83.9
10	Vehicle utilisation.kms/day	238	233	284	282	271	269
11	Total stores per lakh effective kilometres (Index)	11972 (100)	11731 (98)	7639 (64)	3958 (33)	6932 (58)	7083 (59)

Source : Estimates based on data obtained from Annual Administration Reports and Statistical Section, KSRTC, Trivandrum.

observed that the inventory holdings of all the store items except tyres and tubes decreased during the period. The inventory of tyres and tubes per bus which was Rs. 405.0 at the end of the year 1965-66 dropped to Rs. 243.0 at the end of 1976-77 and then shot upto Rs. 502.6 at the end of 1978-79.

Total inventory per lakh effective kilometres and its index are also presented in Table 4.18. The figures indicate that total stores per lakh kilometres declined by 41% from Rs. 11,972 at the end of 1965-66 to Rs. 7083 at the end of 1978-79. It can be observed that the index of inventory per lakh effective kilometres closely followed the index of total stores per bus in KSRTC.

The considerable drop in the total inventory held per bus and per kilometre as noticed above during the period from 1965-66 to 1978-79 must be viewed in the context of the price rise of various inputs. The hike in materials cost in STUs in general and KSRTC in particular is evident from tables 4.10 and 4.11. It is seen that the cost of total stores in KSRTC as well as in other STUs increased by about 75 % during the period from 1972-73 to 1979-80. Hence it can be normally expected that the drop in the inventory held per bus during the period, despite significant increase in the cost of materials, must have resulted in substantial reduction in the physical stock of materials held during the period.

At this stage it is necessary to examine how the inventory per bus and per lakh kilometre in KBRIC compares with the inventory levels in other undertakings.

Inventory position in different undertakings

Table 4.19 presents the inventory per lakh kilometres in different undertakings.

Table 4.19  
Inventory per lakh effective kilometres  
in different STUs (1978-79)

Undertaking	Spare parts	Tyres & tubes	Lubri-cants	Fuel	Other stores	Total stores
KBRIC (1978-79)	4775	733	80	164	1330	7083
(1976-77)	2203	275	113	153	1213	3958
Karnataka SRTC	7339	2240	402	345	2728	13056
Andhra Pradesh SRTC ( 1978 )	5184	714	335	261	1326	7770
Gujarat SRTC	4139	162	155	275	2285	7017
Maharashtra SRTC	7361	1729	763	344	5885	16082
Madhya Pradesh SRTC	14786	2210	126	3283	12248	32653
Cheran TOL	5571	539	649	457	396	7612

Source : Estimates based on data obtained from Association of State Road Transport Undertakings, Report on the performance of Nationalised Road Transport Undertakings, 1978-79 and 1979-80, CIRT, Poona.

The total stores per lakh kilometres in 1978-79 shows wide variations among the listed undertakings. It ranges from Rs. 7017 in Gujarat SRTC to Rs. 32653 in Madhya Pradesh SRTC.



The inventory held in KERTC was Rs. 7083, which was very close to the level in Gujarat SRTC. The inventory level in Karnataka SRTC was nearly double that of KERTC and in Maharashtra SRTC it was still higher. The inventory of spareparts per lakh kilometres was also the lowest in Gujarat SRTC followed by KERTC. The highest inventory was again in Madhya Pradesh SRTC. Among the sample STUs Maharashtra and Karnataka SRTCs maintained the highest level of spareparts per lakh kilometres. It may be further noted that the spareparts inventory per lakh kilometres in KERTC at the end of 1976-77 was less than half the level at the end of 1978-79. The total inventory was also considerably lower than the level in 1978-79 as seen from the Table. Hence it can be concluded that the average inventory levels per lakh kilometre in KERTC was one of the lowest compared to other similar undertakings.

Table 4.20 shows comparative figures of inventory holdings per bus in the five undertakings for 1974-75 and 1978-79. In 1974-75 the total stores per bus was the lowest in KERTC ( Rs. 8469 ) followed by Gujarat SRTC ( Rs. 10775 ). Karnataka SRTC had the highest total stores inventory of Rs. 15275 per bus, which was more than 180 % of the KERTC figure. The spareparts inventory which constituted the major portion of total stores was also the lowest in KERTC and the highest in Karnataka SRTC.

**Table 4.20**  
**Inventory Holdings per bus in STUs**

( Rupees )

Sl No	Undertaking	Spare Tyres & parts	Tubes	Lubri- cants	Fuel	Other Stores	Total Stores
	Kerala SRTC	5194	337	224	187	2527	8469
	Karnataka SRTC	9661	792	298	208	4216	15275
1974-75	Andhra Pradesh SRTC	5937	693	95	N.A.	1123	N.A.
	Gujarat SRTC	5782	620	522	375	3476	10775
	Maharashtra SRTC	5637	2539	872	277	4388	13713
	Kerala SRTC	3935	603	67	134	1097	5836
	Karnataka SRTC	5446	1662	299	256	2025	9688
1978-79	Andhra Pradesh SRTC ( 1978 )	4864	68	32	247	1257	6468
	Gujarat SRTC	3457	135	129	230	3063	7014
	Maharashtra SRTC	5542	1302	574	259	4413	12090
	Madhya Pradesh SRTC	9838	1471	84	2185	8150	21728

Source : Estimates based on data obtained from Annual Administration Report of the Undertakings, 1974-75 and Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1978-79 and 1979-80, CIRT, Poona.

The inventory holdings per bus in 1978-79 among the sample undertakings, was substantially lower than the 1974-75 figures. The percentage reduction in inventory held was approximately 34 % in Kerala, Karnataka and Gujarat SRTCs and 12 % in Maharashtra SRTC. The total stores per bus was again the lowest in KSRTC ( Rs. 5836 ). Maharashtra SRTC had the highest inventory holding among the sample undertakings -

Rs. 12,090 per bus, which was more than twice that of KERTC. The spareparts inventory was the lowest in Gujarat SRTC followed by KERTC. The inventory holdings per bus in Madhya Pradesh SRTC was found to be extremely higher than all the undertakings in the sample considered.

The following conclusions can be drawn from the foregoing analysis of inventory holdings per bus and per lakh kilometre in SRTC and other similar undertakings :

- i) There was wide variation among the undertakings with respect to the inventory held per bus and per kilometre.
- ii) The reduction in inventory holdings observed between the period 1974-75 and 1978-79 was not peculiar to KERTC alone. Other undertakings have also reduced the inventory levels during this period at varying degrees.
- iii) Inventory held per bus and per lakh kilometre in KERTC was one of the lowest among the sample undertakings. This was found to be true for the year ending 1974-75 as well as for the year 1978-79.

While analysing the consumption pattern of stores it was observed that the consumption of total stores per bus and per kilometre in KERTC was one of the highest among the similar undertakings. This indicates a situation of higher consumption rates and at the same time lower inventory levels in KERTC than in other similar undertakings.

The inventory levels and consumption rates can be related and understood better by an analysis of the number of months in which the inventory held would be consumed.

The Number of Months for which stocks are held

The ratio of the volume of inventory to the number of months during which it would be consumed is a valuable indicator of the efficiency of inventory management. A high ratio will generally show excessive amounts of materials stocked in relation to the consumption rate and a very low ratio will indicate inadequate inventory levels and a "hand-to-mouth" inventory policy which is also not quite desirable.

As a single measure of inventory position this ratio is more dependable than other indicators, because :

- (i) Changes in the cost of materials will be reflected in the value of inventory held as well as consumption. Hence this ratio will not be very much sensitive to price changes although the methods of valuation of inventory and consumption may have some effect on the value of the ratio.
- (ii) Effects of changes in the proportion of old vehicles in the fleet will also be taken care of by this ratio since such changes will be reflected in the consumption of materials, especially spareparts.

The inventory position in the KSRIC in terms of the volume of inventory to the number of months in which it is consumed is shown in Table 4.21.

Table 4.21  
Inventory for Number of months of Consumption - KSRIC

Sl No	Items	(Number of months)					
		65-66	70-71	75-76	76-77	77-78	78-79
1.	Spareparts	25.17	11.47	5.35	2.08	4.23	3.67
2.	Tyres & tubes	0.80	1.42	0.26	0.17	0.25	0.40
3.	Lubricants	3.22	2.50	0.68	0.25	0.09	0.17
4.	Fuel	0.16	0.09	0.07	0.05	0.05	0.05
5.	Other stores	10.30	7.32	4.54	2.96	2.31	3.05
6.	Total Stores	4.05	3.03	1.19	0.60	0.97	0.97
7.	Total stores (excl.fuel)	8.56	5.71	2.09	1.07	1.70	1.71

Note : Other stores include batteries also.

Source : Estimates based on data obtained from Annual Administration Reports and Statistical Section, KSRIC, Trivandrum.

The total stores inventory in KSRIC decreased from 4.05 months of consumption in 1965-66 to 0.97 months in 1978-79. The inventory of total stores excluding fuel declined more sharply from 8.56 months to 1.71 months during the same period. This was because of the steep fall in the inventory of spareparts and lubricants during this period as compared to the inventory of fuel. While the inventory of spareparts

dropped from 25.17 months consumption in 1965-66 to 3.67 months in 1978-79, the inventory of fuel decreased from 0.16 months to 0.05 months. It can be observed that the inventory of total stores excluding fuel fell more or less at a steady rate from 1965-66 onwards except in 1976-77 when there was an unusually low inventory level.

A comparison of the inventory position in terms of the number of months consumption in various STUs also shows that the inventory holdings in KERTC was substantially lower than in almost all other similar undertakings. The data for different undertakings in 1974-75 and 1978-79 are given in Table 4.22. The total stores inventory at the end of 1974-75 was the lowest in Andhra Pradesh SRTC ( 1.78 months ) closely followed by KERTC ( 1.84 months ). The highest level of total stores was observed in Maharashtra SRTC which was nearly twice that of KERTC. It is significant to note that although the inventory of total stores in Kerala SRTC was one of the lowest , its spare parts inventory at the end of 1974-75 was on the higher side among the sample undertakings. However, the spare-parts inventory dropped considerably from 9.59 months of consumption at the end of 1974-75 to 3.67 months at the end of 1978-79. Although the spareparts inventory decreased in all the sample undertakings except in Andhra Pradesh SRTC during this period, the percentage reduction was the highest in KERTC.

Table 4.22

Inventory for Number of Months Consumption  
in different SUs

( Number of months )

Year	Undertaking	Spare Parts	Tyres & Tubes	Lubri-cants	Fuel	Other Stores	Total Stores
1974-75	Kerala SRTC	9.59	0.31	0.43	0.09	5.74	1.84
	Karnataka SRTC	13.29	0.66	0.99	0.11	8.44	3.27
	Andhra Pradesh SRTC	4.75	0.45	0.17	0.10	3.37	1.78
	Gujarat SRTC	8.25	0.58	1.36	0.23	5.98	2.47
	Maharashtra SRTC	8.64	2.42	2.57	0.20	7.59	3.44
1978-79	Kerala SRTC	3.67	0.40	0.17	0.05	3.05	0.97
	Karnataka SRTC	5.17	1.08	0.90	0.11	3.79	1.67
	Andhra Pradesh SRTC	6.30	0.05	0.06	0.10	2.42	1.14
	Gujarat SRTC	4.62	0.13	0.41	0.11	3.10	1.32
	Maharashtra SRTC	5.73	0.75	1.43	0.12	5.55	1.99
	Madhya Pradesh SRTC	13.65	0.82	0.20	0.91	11.19	3.57
	M&T, Bombay (1981)	12.42	12.92	2.23	0.15	1.77	2.44
	Calcutta SRTC	14.06	1.83	2.56	0.16	9.52	6.48

Source : Estimates based on data obtained from Annual Administration Report of the Undertakings, 1974-75 and Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1978-79 and 1979-80, CIRT, Poona.

The inventory of total stores at the end of 1978-79 was significantly lower than that at the end of 1974-75 in all the sample undertakings. KSBTC with a total stores inventory of 0.97 months was at the lowest, while Maharashtra SRTC with inventory for 1.99 months of consumption had the highest total stores inventory among the sample undertakings. Data pertaining to the inventory levels of Calcutta SRTC and Madhya Pradesh SRTC show that inventory positions in these undertakings were much higher than in the five STUs. The total stores inventory was as high as 6.48 months and 3.57 months respectively in these undertakings. The spareparts inventory varied from 3.67 months in KSBTC to 14.06 months in Calcutta SRTC. Among the five undertakings, Andhra Pradesh SRTC had the highest level of spareparts inventory of 6.30 months ( 1978 data ).

While analysing the inventory position earlier, it was observed that, like KSBTC, Gujarat SRTC also had extremely low levels of inventory per bus and per lakh kilometres. However, in terms of the number of months of consumption, the inventory level in Gujarat SRTC is found to be significantly higher than that of KSBTC.

The preceding analysis of inventory position in KSBTC and in other undertakings with respect to the various indicators such as inventory per bus, inventory per lakh kilometres and inventory for number of months of consumption



has shown that

- i) the inventory levels in KSRIC was at the lowest among the similar undertakings with respect to almost all the indicators used,
- ii) that the inventory levels in terms of the above indicators, have been fast decreasing in KSRIC during the review period 1965-66 to 1978-79, and
- iii) that comparison with other similar undertakings, the inventory position in KSRIC during the recent periods has been much worse than in the earlier periods.

If the stocking patterns in other similar undertakings, by and large, can be of any guidance and if it can be assumed that other undertakings are also genuinely interested in optimising inventory decisions within the existing constraints, then the above situation in KSRIC is an indicator of a more serious problem. Inadequate inventory level is at least as undesirable and critical as overstocking of inventories. Very low inventory levels will almost certainly hamper the timely availability of the right type of materials for maintenance and operation. Frequent stockouts of materials, large amounts of emergency purchases often at uneconomical rates, use of substandard spares resulting in more frequent breakdowns, long delay in repairing vehicles and other similar problems can be normally expected from such a situation.

### Store Purchases

The total annual purchase of materials ( including fuel) in KBRIC went up from only Rs. 2.30 crores in 1965-66 to approx. Rs. 19.00 crores in 1978-79. This increase in the absolute volume of purchases can be analysed in relation to the changes in the consumption rate and inventory levels in the undertaking over the years. The following ratios can be used to understand this relationship.

#### i) Ratio of purchase to consumption

Ideally this ratio should be one or approximately one. A higher value of this ratio indicates more purchases in relation to consumption, which may be resorted if price increases or supply problems are anticipated. A lower value of the ratio would indicate relatively less purchases and use of the earlier stock to meet the requirements.

#### ii) Ratio of purchase to stock ( inventory )

A high value of this ratio shows relatively less inventory for a given level of purchase which implies a better management of resources. But very high levels of this ratio is also undesirable as it may indicate inadequate inventory levels and frequent and uneconomical purchases in small quantities. It may also result from unusually high levels of

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① See Appendix - VIII for details of store purchases in KBRIC.

purchase to consumption. A low value of the ratio may indicate high levels of inventory.

Table 4.23 presents both the above ratios for the total stores and selected components of stores in KERTC from 1965-66 to 1978-79. Fuel has not been included in the analysis since normally its ratio of purchase to consumption would be one and the inventory would be very low in relation to purchase.

**Table 4.23**  
**Store Purchase in KERTC**

Year	Spareparts		Tyres&Tubes		Lubricants		Total Stores	
	Pur- chase Con- sump- tion	Pur- chase Stock	Pur- chase Con- sump- tion	Pur- chase Stock	Pur- chase Con- sump- tion	Pur- chase Stock	Pur- chase Con- sump- tion	Pur- chase Stock
1965-66	1.90	0.90	0.90	12.90	1.00	3.70	1.10	1.50
1970-71	1.00	1.00	1.00	8.70	1.10	5.40	1.10	2.20
1975-76	1.35	3.04	1.00	47.30	1.10	20.00	1.10	6.40
1976-77	1.20	7.00	1.00	70.90	1.00	49.60	1.10	12.10
1977-78	1.00	3.00	1.10	53.30	1.00	130.00	1.00	6.90
1978-79	1.10	3.60	1.00	30.50	1.00	72.00	1.00	7.10

Source : Estimates based on data obtained from Annual Administration Reports, Statistical Section and Stock Accounts Section, KERTC, Trivandrum.

The analysis of data in KERTC shows that the ratio of purchase to consumption for all the items was more or less equal to one with very few exceptions. The ratio for spare parts in 1965-66 was found to be as high as 1.90. On further analysis it was observed that the consumption figure

for spareparts was unusually low and that for 'other stores' was very high. This explains why the ratio for the total stores is only 1.10. It may be that the purchase and consumption figures of these two items were distorted in 1965-66, probably due to the lack of a clear definition of 'other stores'.

The ratio of purchase to stock shows a steady rise for almost all the items in KSRTC from 1965-66 to 1978-79. This is a logical outcome of the reduced inventory levels noticed in the earlier analysis.

Table 4.24 compares the ratios for different undertakings. The purchase figures for Andhra Pradesh SRTC were not available. The ratio of purchase to consumption for all the undertakings analysed was almost equal to one.

The ratio of purchase to stock for total stores in 1974-75 was the highest in KSRTC and lowest in Karnataka SRTC. In 1978-79 also KSRTC had the highest value of this ratio for total stores. The ratio varied from 1.50 for Calcutta State Transport to 7.10 for KSRTC in 1978-79. Among the sample undertakings, Maharashtra SRTC had the lowest ratio ( 3.90 ) for total stores excluding fuel. The ratio for spareparts in 1974-75 was the highest in Maharashtra and Gujarat SRTCs and lowest in Karnataka SRTC. However, in 1978-79 KSRTC showed the highest value of the ratio, indicating a definite deterioration in the inventory position,

Table 2x2b  
Store Purchases in Different Undertakings

Year & Undertakings	Spareparts		Tyres&Tubes		Lubricants		Total Stores	
	Par- chase Con- sump- tion	Par- chase Stock	Par- chase Con- sump- tion	Par- chase Stock	Par- chase Con- sump- tion	Par- chase Stock	Par- chase Con- sump- tion	Par- chase Stock
<b>1974-75</b>								
Kerala SRTC	1.10	1.40	1.00	38.40	1.00	28.40	1.00	3.80
Karnataka SRTC	1.20	1.00	1.00	18.20	1.00	12.10	1.10	2.50
Andhra Pra- desh SRTC	NA	NA	NA	NA	NA	NA	NA	NA
Gujarat SRTC	1.10	1.50	0.90	19.40	0.80	7.30	1.00	3.00
Maharashtra SRTC	1.00	1.50	1.10	5.60	1.10	5.00	1.10	2.60
<b>1978-79</b>								
Kerala SRTC	1.10	3.60	1.00	30.50	1.00	72.00	1.00	7.10
Karnataka SRTC	0.90	2.10	1.00	11.40	1.00	13.60	1.00	4.30
Andhra Pra- desh SRTC	NA	NA	NA	NA	NA	NA	NA	NA
Gujarat SRTC	1.00	2.60	1.00	94.20	1.00	29.10	1.00	5.40
Maharashtra SRTC	0.90	1.90	1.00	15.90	1.00	8.10	1.00	3.90
Madhya Pra- desh SRTC	0.90	0.80	1.00	14.70	1.00	60.30	1.00	2.20
Calcutta SRTC	1.30	1.10	1.00	6.80	1.10	5.40	1.20	1.90

Source : Estimates based on data obtained from Annual Administration Report of the Undertakings, 1974-75 and Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Undertakings, 1978-79 and 1979-80, CRTI, Poona.

purchase to consumption ratio remaining the same in both the periods. This ratio for spareparts in Madhya Pradesh SRTC was only 0.80 and in Maharashtra SRTC it was 1.90 in the year 1978-79. For lubricants also the ratio of purchase to stock was the highest in SRTC in both the periods analysed.

This analysis also supports the conclusions made earlier regarding the inventory position in SRTC. The unusually high value of purchase to stock ratio in SRTC also indicates frequent purchases in smaller lots resulting in undue increase in the overall costs.

#### The Quality of Service

It may be recalled that state transport undertakings are public utility services. They are expected to provide efficient, economic, convenient and comfortable transport services to the public.

It was hypothesised earlier that inadequate inventory levels would lead to delay in repairing vehicles, increased breakdowns due to the use of substitute and low quality materials etc. If so, the quality of service provided by the undertaking as indicated by the number of breakdowns, punctuality, accidents and cancelled trips will be affected by the inventory management practices.

Table 4.25 shows the extent of breakdowns, punctuality and accidents in KBRIC during the period from 1965-66 to 1979-80.

**Table 4.25**  
**Quality of Service in KBRIC**

Year	Breakdown per 10,000 kms.	% Punctuality		Accident per 1 lakh kms.
		Departure	Arrival	
1965-66	1.1	90.2	66.5	2.5
1970-71	2.1	84.1	79.0	2.4
1975-76	2.4	81.6	78.4	2.5
1976-77	2.1	83.8	79.9	2.2
1977-78	1.8	NA	NA	2.4
1978-79	2.8	78.8	75.8	2.7
1979-80	3.0	81.2	78.9	2.5

Source : (i) KBRIC, Annual Administration Reports, various years.

(ii) Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1975-76 to 1979-80, CIRT, Poona.

The following observations can be made from the above Table.

- 1) Breakdowns per 10,000 kilometres increased from 1.1 in 1965-66 to 3.0 in 1979-80. It shows a definitely increasing trend.
- ii) The punctuality of departure deteriorated from 90.2 % to 81.2 % during the period. The punctuality of arrival, which

was rather low ( 66.5 % ) in 1965-66, later recovered and remained more or less steady thereafter.

iii) Accidents per lakh of kilometres decreased marginally during 1975-77 period, but again rose to the earlier level subsequently.

The cancellation of scheduled trips normally occurs on account of the breakdown of vehicles or non-availability of vehicles for service. This is also an indicator of the quality of service offered by the undertaking. The Committee on Road Transport noted that about two-thirds of the cancellation of services in KERTC is due to the inability to repair vehicles in time for want of spare parts and spare assemblies.<sup>9</sup> The percent of scheduled trips cancelled in KERTC from 1965-66 to 1978-79 is given in Table 4.26. The data shows a clear and substantial increase in the cancellation of trips during the period.

**Table 4.26**  
**Trips cancelled in KERTC**

<u>Year</u>	<u>Trips cancelled (percentage)</u>
1965-66	4.3
1968-69	8.7
1970-71	12.3
1972-73	NA
1974-75	12.3
1976-77	11.1
1978-79	12.5

Source : KERTC, Annual Administration Reports, various years.

9 See Committee on Road Transport, op.cit. p.146.



The above analysis indicates a gradual deterioration in the quality of services provided by K&RTIC with respect to most of the indicators used. This is in time with the reduction in inventory levels noticed during the same period. Since the inventory levels in K&RTIC were also found to be significantly lower than other similar undertakings, it is necessary to compare the quality of service in this undertaking with other STUs.

Table 4.27 presents data on the quality of service in different undertakings. The following observations can be made from the table.

- i) The breakdown rate in K&RTIC was the highest among all the undertakings analysed, both in 1974-75 and in 1978-79. The rate of breakdown in K&RTIC is considerably higher than in all the others. While the breakdown rate in the other four undertakings under study either remained constant or decreased, the rate of breakdown in K&RTIC increased from 2.3 in 1974-75 to 2.8 in 1978-79.
- ii) The punctuality of departure and arrival was also the lowest in K&RTIC in both the years analysed. Punctuality also declined in K&RTIC during the period 1974-75 to 1978-79.
- iii) The rate of accidents in K&RTIC was at an alarming level of 2.3 per lakh kilometres in 1974-75 and 2.7 in 1978-79. The next highest rate of accident in any of the undertakings listed was only 0.6 which was in Maharashtra STIC.

**Table 4.27**  
**Quality of Service in different Undertakings**

Year	Undertakings	Breakdown per 10,000kms.	% Funtctuality		Accident per lakh kms.
			Departure	Arrival	
	Kerala SRTC	2.3	83.9	81.4	2.3
	Karnataka SRTC	0.8	89.8	90.5	0.3
1974-75	Andhra Pradesh SRTC	0.9	90.4	90.4	0.3
	Gujarat SRTC	1.0	91.0	91.8	0.4
	Maharashtra SRTC	1.0	86.2	88.0	0.6
	Kerala SRTC	2.8	78.8	75.8	2.7
	Karnataka SRTC	0.7	87.7	88.7	0.4
1978-79	Andhra Pradesh SRTC	0.9	97.8	97.8	0.2
	Gujarat SRTC	0.6	93.9	94.0	0.4
	Maharashtra SRTC	0.6	90.8	91.0	0.4
	Haryana SI	0.4	95.0	95.0	0.2
	Rajasthan SRTC	0.6	90.2	94.1	0.3
	Bihar SRTC	1.1	91.7	87.8	0.2

**Source :** Association of State Road Transport Undertakings,  
Report on the Performance of Nationalised Road  
Transport Undertakings, 1974-75 and 1978-79,  
CIRT, Poona.

Table 4.28 shows the classification of 33 major undertakings on the basis of rate of breakdowns per 10,000 kms in the year 1979-80.

**Table 4.28**  
**Classification of State Transport Undertakings**

Rate of Breakdown	Undertakings
Less than 0.50	Cheran TOL, Cholan BWCL, Thiruvalluvar TOL, Gujarat SRTC, Haryana ST.
0.50 to 1.00	Andhra SRTC, Karnataka SRTC, Maharashtra SRTC, Rajasthan SRTC, Orissa RTCL, Himachal RTC, UPSRTC, Kattabomman TOL, Pandiyan BWCL, Anna TOL.
1.00 to 1.50	North Bengal SRTC, Orissa SRTC, MPBRTC, Punjab ST, Bihar SRTC.
1.50 to 2.00	Pepsu RTC, Pallavan TOL (Metro), Bombay TOL (Metro).
2.00 to 3.00	Manipur SRTC, BEST Undertaking, Poona MT, Delhi TC.
3.00 to 4.00	Pallavan TOL ( Dist ), Kerala SRTC.
4.12	Tripura RTC
7.22	Ahmedabad MT
12.23	Kolhapur MT
20.40	Calcutt, TC

Source : Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1978-79 and 1979-80, CIRT, Poona.

It can be observed that all the sample undertakings except KSRIC had a rate of breakdown of less than one. KSRIC and Pallavan (Dist ) Transport Company Ltd. had breakdown rate between 3.0 and 4.0. There were four undertakings with higher rates of breakdown. But all of them are either city transport undertakings or they operate in predominantly hilly regions.

Although KSRIC and Pallavan ( Dist.) TCL had the same rate of breakdowns in 1979-80, with respect to the rate of accidents and punctuality, KSRIC showed a lower quality of service than Pallavan ( Dist.) TCL as can be observed from Table 4.29.

Table 4.29  
Quality of Service in Pallavan(Dist)TCL & KSRIC  
(1979-80 )

Indicator	Pallavan (Dist)TCL	KSRIC
(i) Breakdowns/10,000kms.	3.00	3.00
(ii) Accidents/lakh kms.	1.12	2.50
(iii) Percent punctuality :		
(a) Departure	89.80	81.20
(b) Arrival	88.80	78.90

Source : Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1978-79 and 1979-80, CIRT, Poona.

Classification of 33 state transport undertakings on the basis of rate of accidents in 1979-80 is given in Table 4.30. It shows that KSRTC had an accident rate between 2.00 and 3.00 per lakh kilometres, while all other similar undertakings had less than 0.50 during the same year. There were only four undertakings among the 33 studied, having an equal or higher rate of accident than KSRTC. But all of them operate exclusively city services and cannot be compared with KSRTC which operate inter-district and inter-state services as well.

Table 4.30  
Classification of State Transport Undertakings  
on the basis of Rate of Accidents per lakh kms.

( 1979-80 )

Rate of Accident	Undertakings
Less than 0.30	Andhra Pradesh SRTC, Bihar SRTC, North Bengal SRTC, Rajasthan SRTC, Orissa SRTC, Anna TOL, Mizoram SRTC, UPSRTC, Haryana ST, Manipur SRTC, Kolhapur MT.
0.30 to 0.50	Gujarat SRTC, Karnataka SRTC, Maharashtra SRTC, MP SRTC, Pepsu SRTC, Cheran TOL, Orissa RTCL, Punjab ST, Cholan RWCL.
0.50 to 1.00	Tripura SRTC, Kattabomman TOL, Thiruvalluvar TOL, Delhi TC.
1.00 to 1.50	Pandiyam RWCL, Pallavan TOL (Dist), Poona MT.
1.50 to 2.00	Calcutta TC.
2.00 to 3.00	Kerala SRTC, Bombay Metro TOL, Ahmedabad MT, Pallavan TOL (Metro).
9.88	BEST Undertaking.

Source : Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertaking, 1978-79 and 1979-80, CIRT, Poona.

The foregoing analysis of the quality of service trends in KERTC as well as comparisons with other similar undertakings has shown that

- i) the quality of service in KERTC has deteriorated during the review period 1965-66 to 1978-79; and that
- ii) the quality of service in KERTC was considerably lower than in all other similar undertakings analysed.

It may be recalled that the inventory position in KERTC also demonstrated the same pattern as above. Although there are innumerable other factors like age of the fleet, maintenance policies, motivation and training of operating staff, etc. which tend to influence the quality of service in any transport undertaking, it can be reasonably concluded from the above analysis that the inventory levels in KERTC had a strong positive relationship with the quality of transport services provided.

#### The vicious circle in KERTC

It is now necessary to further examine the reasons for the extremely low and uneconomic levels of inventory in KERTC in comparison with other undertakings. This may be revealed from the analysis of the financial performance of KERTC over the years. Some of the indicators presented in

Tables 4.1 and 4.2 highlighted the widening gap between revenue and costs and the poor financial performance of this undertaking. KSRTC earned a profit during the first two years of its operation, i.e. 1965-66 and 1966-67. Thereafter, it has been continuously incurring losses. The extent of losses since 1967-68 is given in Table 4.31. It shows that the average losses per year during the five year period from 1967-68 to 1971-72 was Rs. 106 lakhs, while the losses during 1974-75 to 1978-79 was Rs. 342 lakhs per year.

Table 4.31  
Losses in KSRTC

Year	Loss (Rs. lakhs)	Average loss per year (Rs. lakhs)
1967-68	7	106/year
1968-69	159	
1969-70	67	
1970-71	131	
1971-72	164	
1972-73 & 1973-74	Not available	
1974-75	470	342/year
1975-76	422	
1976-77	113	
1977-78	347	
1978-79	350	

Source : State Planning Board, Economic Review, Govt. of Kerala, 1980.

It is seen that the total accumulated losses at the end of March 1982 was Rs. 51 crores and the Corporation was expected to lose another Rs. 17 crores during 1982-83.<sup>10</sup> The losses are increasing unabated year after year, inspite of the periodic fare revisions, rescheduling exercises, and cost reduction programmes.

This can be explained by a vicious circle as shown in Figure 4.1. The tight financial position due to the increasing losses has led to "hand-to-mouth" buying and low inventory levels. This increases the overall costs of inventory management by frequent emergency purchases, inability to obtain economies from bulk purchasing and transportation and high stockouts which, in turn, delay vehicle repairs, reduce vehicle availability and result in loss of revenue. The increased costs and less than proportionate increases in revenue lead to higher losses year after year, thus forming a vicious circle.

How can this vicious circle be broken? Proper management of materials can definitely help to break this circle and improve the overall performance. This is examined in subsequent chapters.

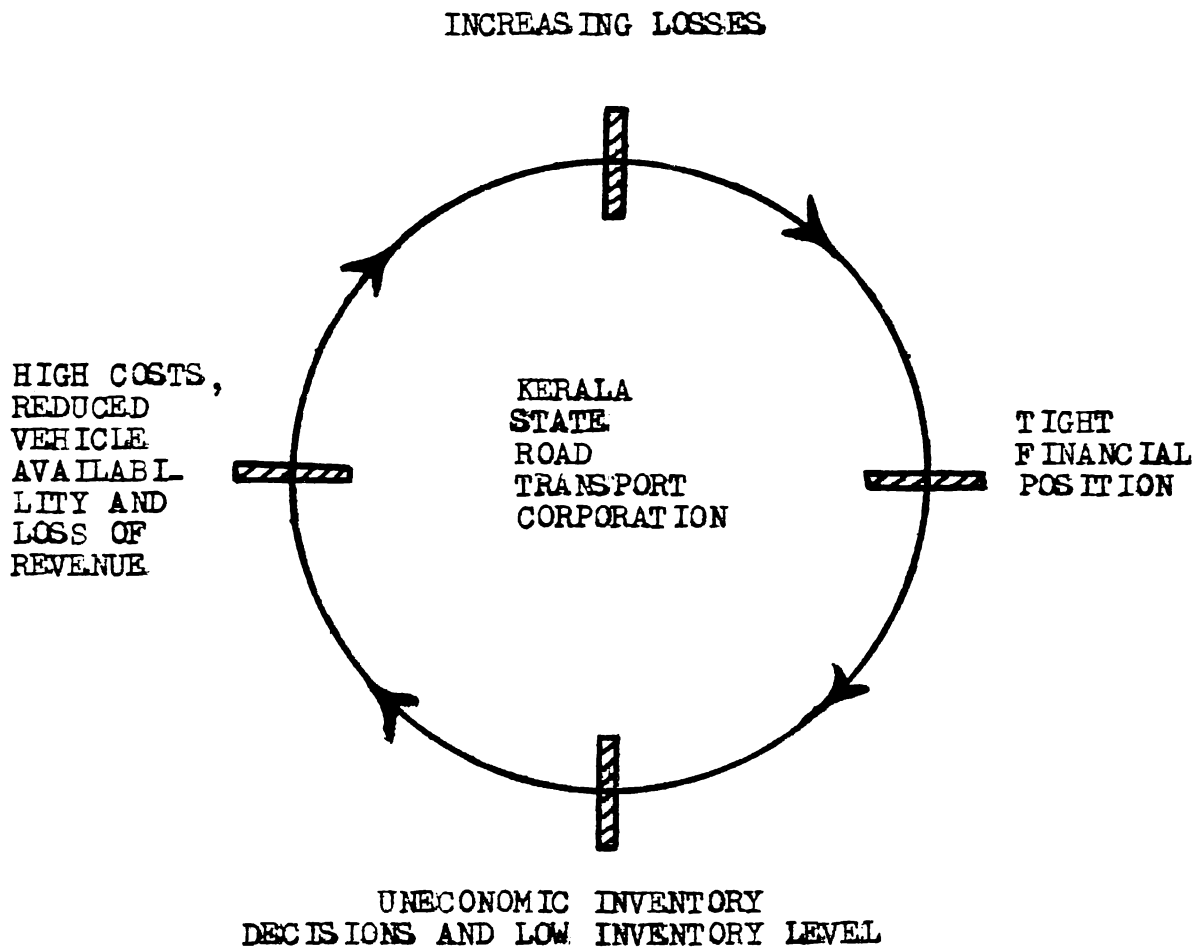
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<sup>10</sup> "Kerala Road Corporation loss total 51 crores", The Hindustan Times ( New Delhi ), Saturday, 5 June 1982.



Figure 4.1  
THE VICIOUS CIRCLE IN K.S.R.T.C.



**CHAPTER - V**

**MATERIALS MANAGEMENT ORGANIZATION**

To organise, according to Webster's dictionary means: "To arrange or constitute in interdependent parts each having a special function or relation with respect to the whole ..... To become systematized or constituted into a whole of interdependent parts". This indicates that the total work to be performed must be broken down into various subtasks and jobs, and the subtasks assigned to various individuals then interrelated and coordinated in such a way as to meet organisational objectives. The organisation structure so designed establishes the authority and responsibility relationships among its personnel. It is really a formalised plan for the most efficient employment of personnel.

The level of performance attained by a group of people in any organisation is largely determined by three factors: (i) capabilities of the personnel, (ii) their motivation, and (iii) the organisational structure within which they function. The organisation structure constitutes a framework that determines to a great extent the manner in which various individuals and groups of people work together and channel their efforts towards a common goal. The importance of having a sound organisation structure was highlighted by Peter Drucker, when he stated :

Good organisation structure does not by itself produce good performance - just as a good constitution does not guarantee great presidents, or good laws, or a moral society. But a poor organisation structure makes good performance impossible no matter how good the individual managers may be. To improve organisation structure ... will therefore always improve performance.

### Basic Organisational Concepts

Before examining the materials management set up in KMTTC, it is necessary to briefly review some of the basic organisational concepts.

#### (a) Departmentation

The design of an organisation begins with the basic objectives of the enterprise; the use of resources must be directed towards the achievement of these ends. In a state transport undertaking the basic objective is to provide efficient, economic and adequate passenger transport services to the public. This transportation service can be considered as the result of a transformation/conversion process. The intending passengers at the originating bus stations can be conceived as the inputs; they undergo a transformation process as they pass through the transport facility which includes bus, the crew and the road network and reach their destinations. The role of the transport organisation is to provide

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1 Peter F. Drucker, The Practice of Management, New York, Harper & Row, 1954, p.225.

a transformation process that will efficiently convert the factors of production into the desired level and type of transportation service.

In this transformation process, work is performed by management and labour in concert with capital, land, buildings, vehicles and materials. This work is the object of the organisation. This total corporate task is subjected to successive subdivision until areas of work are created that can be performed by a single individual without the aid of subordinates. Such work blocks are then established as jobs.

As jobs are defined, they are grouped into administrative units. The process of partitioning work into jobs and then grouping different jobs into administrative units to facilitate management is called departmentation. Departmentation is usually carried out according to function, product, territory, customer and commodity. But a single mode or departmentation need not be followed throughout an organisation. An organisation must use any and all systems in various operating areas that best suits its peculiar needs. In state transport undertakings it is generally observed that the mode of departmentation is by function at the top management level, for instance, traffic, materials, maintenance, accounts, etc. irrespective of the size of the undertaking. In large undertakings operating in a vast geographical area, traffic

and maintenance functions are often organised on the basis of geographical territory at the middle and lower levels. Materials management department is normally organised by a combination of material groups and geographic territories.

(b) Span of control/management

The span of control refers to the number of subordinates any manager can supervise effectively. Application of this concept in developing the organisation structure establishes some guidelines on how many subordinate individuals or organisational units can be satisfactorily led by any single executive. While it is difficult to set any precise limits on the span of control it is possible to identify several factors which are brought to bear in reaching a decision on how many individuals or units should be assigned to any one executive. These factors include the particular organisational level, the nature of the task, the time factor, the degree of geographic dispersion, the interests and abilities of the subordinates and of the superior, the extent of delegation and the kind of assistance provided to the manager.

Although it is necessary to avoid overburdening the manager with supervisory duties, an over-emphasis on limiting his span of control can lengthen the chain of command and increase the number of organisational levels, with subsequent problems in communication and motivation. A flat structure

with a minimum of levels has definite advantages over the more common pyramidal structure in these respects. So the need to limit the span of control must be weighed carefully against the benefits of reducing the number of organisational levels.

(c) Decentralisation of authority

Decentralisation involves establishing greater formal authority and discretion at the lower organisational levels. This is achieved when upper level managers delegate decision-making responsibilities to their counter parts at the lower levels in the organisation. An organisation can be considered to be more decentralised when more decisions are made at lower levels and the more important those decisions are. The decentralisation of decisionmaking may be desirable not only because it may help to relieve the work burden of the upper level managers, but also because it may provide lower level managers with more challenging work, and hence, greater opportunities for meeting their higher level needs. Decentralisation may be utilised as a means to allow quicker and more appropriate decisions, without waiting for head office approval.

(d) Line and staff authority

The superior has authority over the subordinate because he extracts accountability from him. This type of relationship

in which a superior exercises direct supervision over a subordinate shows line authority. Line authority is action oriented and may be delegated to subordinates in amounts commensurate with the duties that are delegated. Conversely, when a subordinate is given the task of preparing data for or advising management but not given the authority to act, his work is called a staff job. When one looks at an organisation structure as a whole, the general character of line and staff relationships for the total organisation emerges. Certain departments are predominantly staff in their relationship to the entire organisation. Other departments are primarily line.

Having briefly discussed some of the organisational concepts, it is now possible to examine and analyse the materials management set up in KERTC. But since materials management organisation is only a part of the overall structure, which largely determines the environment and the setting in which materials management department has to function, it is difficult to study the materials management organisation in isolation. Hence it is first of all necessary to examine the development and the present pattern of the overall structure before attempting to analyse the materials organisation.



### Organisation of KERTC - Its Evolution

The organisational set up of KERTC has undergone several changes and restructuring ever since it was formed in 1965. This is logically to be expected from an enterprise which has grown substantially in its size and operations during this period.<sup>2</sup> The structure of an organisation should not be considered as a static framework. It should be reorganised as and when necessary in order to meet the growing needs and challenges of the operating environment.

Prior to the formation of the Corporation, the Kerala State Transport Department was headed by a Director of Transport. All the section heads were directly reporting to him as shown in Figure 5.1. In 1965 when the Kerala State Road Transport Corporation was formed, the Director of Transport was replaced by the Chairman and General Manager, who became the administrative head of the Corporation. This set up is shown in Figure 5.2. There were only two officers reporting directly to the General Manager - the Secretary and Deputy General Manager and the Chief Accounts Officer. The traffic, maintenance, purchase and stores and other major sections, except the accounts section were grouped under the Secretary and Deputy General Manager. This set up was further changed in 1968-69 as shown in Figure 5.3. All the senior officers reported directly to the General Manager.

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<sup>2</sup> See Table 4.1, p.81.

Figure 5.1

THE KERALA STATE TRANSPORT DEPARTMENT ORGANIZATION STRUCTURE - (1962-65)

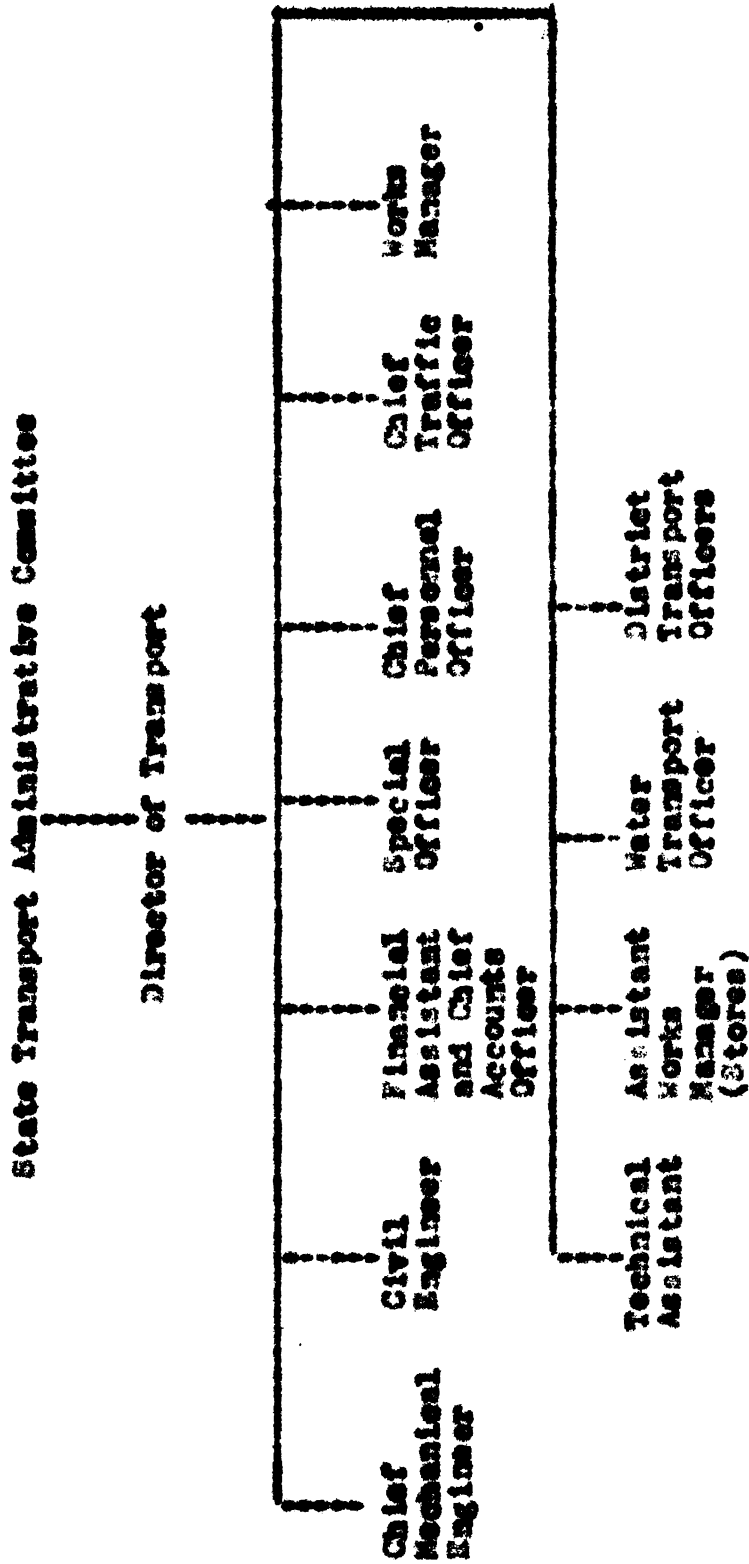
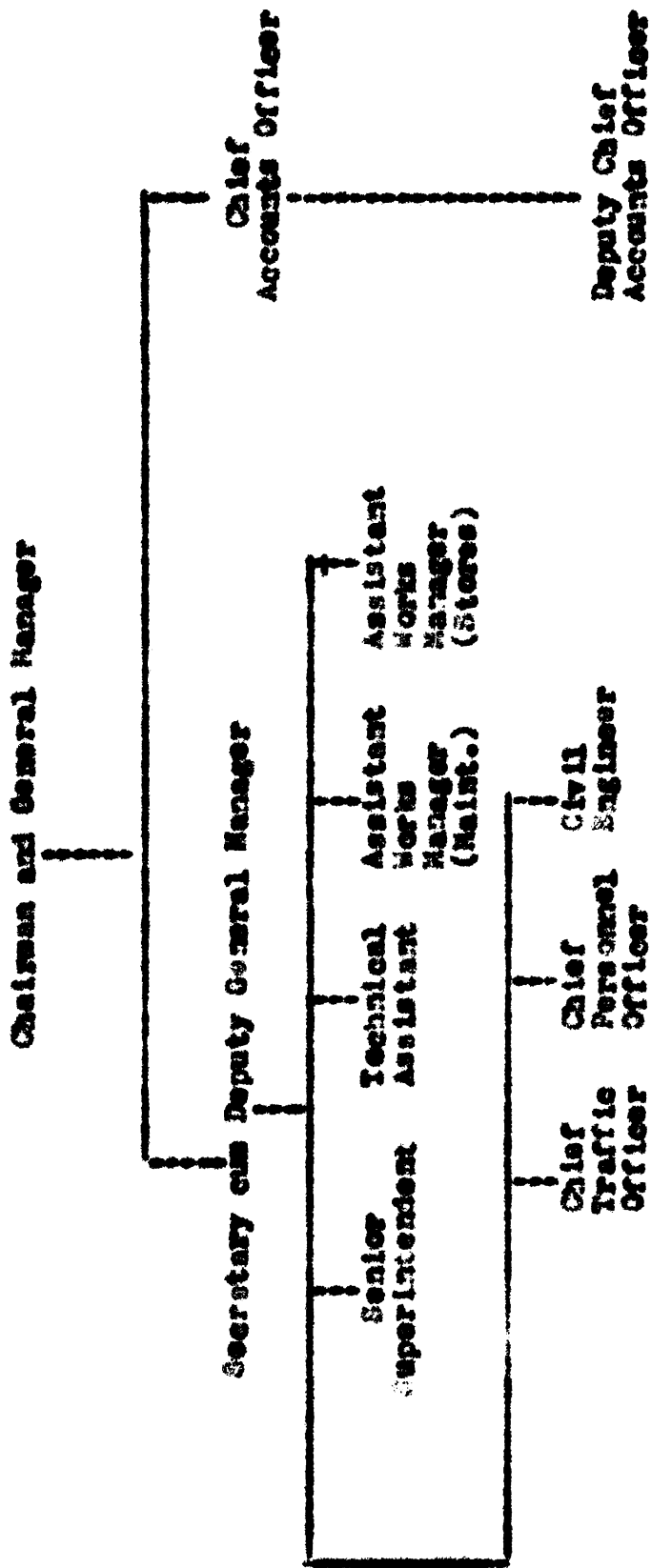
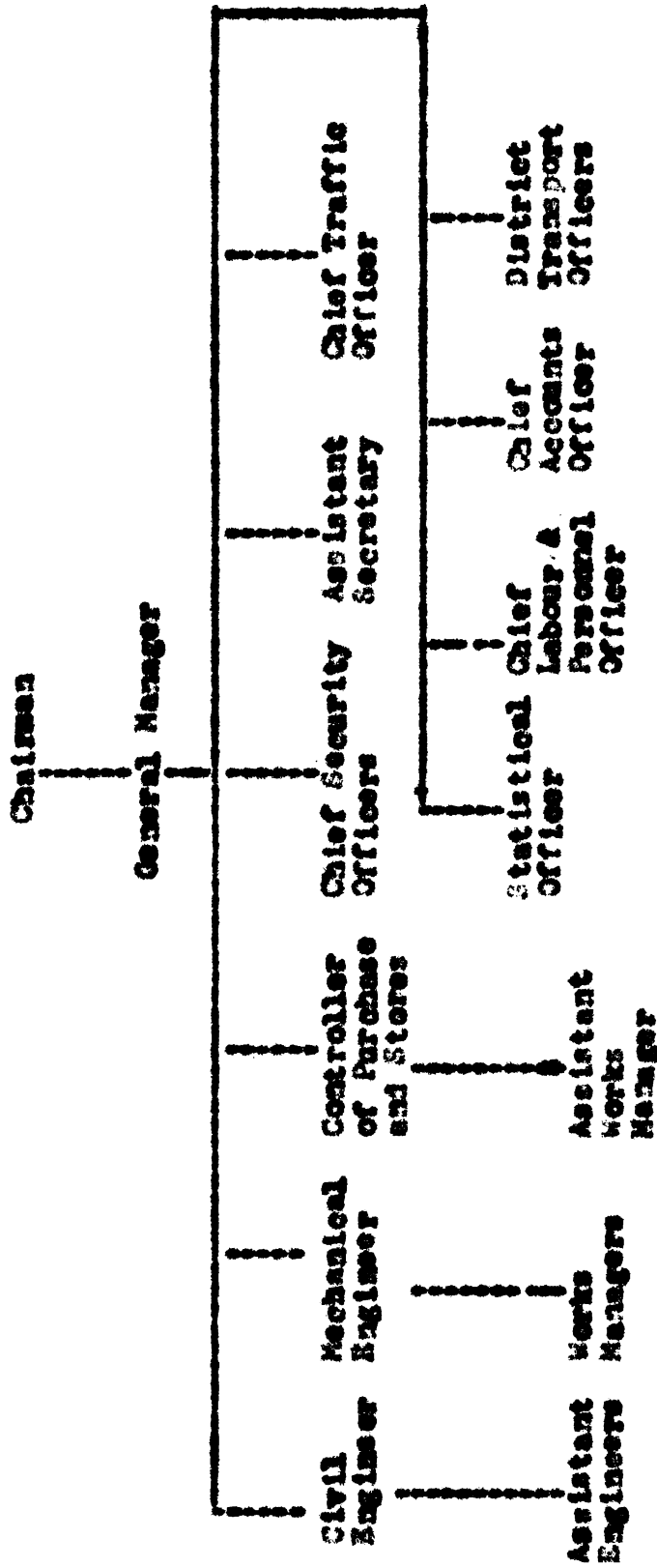


Figure 5.2

ERIC ORGANISATION STRUCTURE - ( 1965-66 )



**Figure 5.3**  
**ISMC ORGANISATION STRUCTURE - (1968-69)**



During 1973-74, the Corporation carried out a major reorganisation of its administrative set up. In the new set up the following five officers were made directly responsible to the General Manager.

1. Chief Accounts Officer
2. Joint General Manager
3. Operations Manager
4. Industrial Relations Manager
5. Secretary

The Chief Accounts Officer was the head of the Accounts branch of the Corporation. Purchase and Stores, Automobile Engineering, Civil Engineering and the Vigilance Sections were under the Joint General Manager. This set up is presented in Figure 5.4.

This above structure was again changed in 1976 as shown in Figure 5.5. The post of Joint General Manager was converted into Deputy General Manager. The Controller of Purchase and Stores, the Chief Accounts Officer and the Secretary reported directly to the General Manager alongwith the Deputy General Manager. The Personnel Officer, the Statistical Officer and the Civil Engineer were also placed directly under the General Manager. The posts of Operations Manager was abolished and the Chief Traffic Officer was placed under the Deputy General Manager alongwith the Mechanical Engineers and District Transport Officers.

Figure 5.4

KUBEC ORGANISATION STRUCTURE - (1973-74)

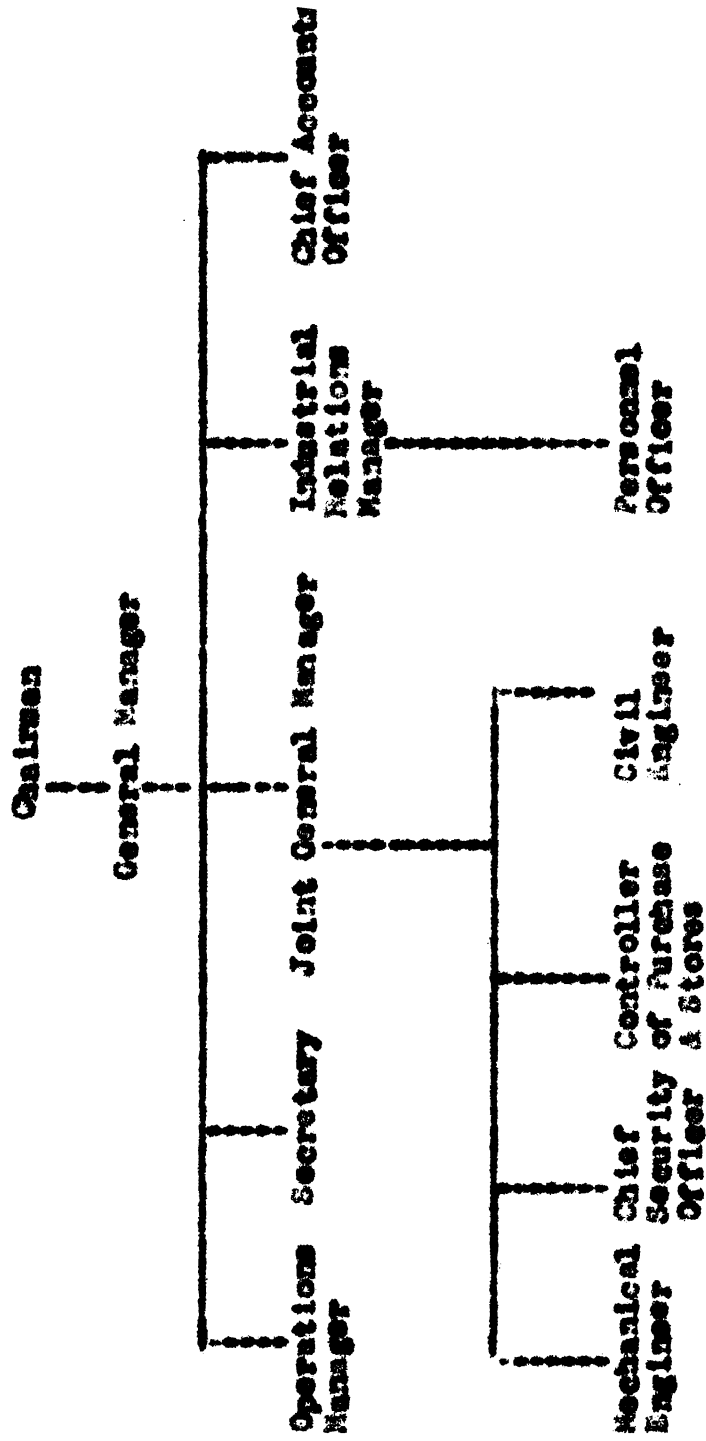
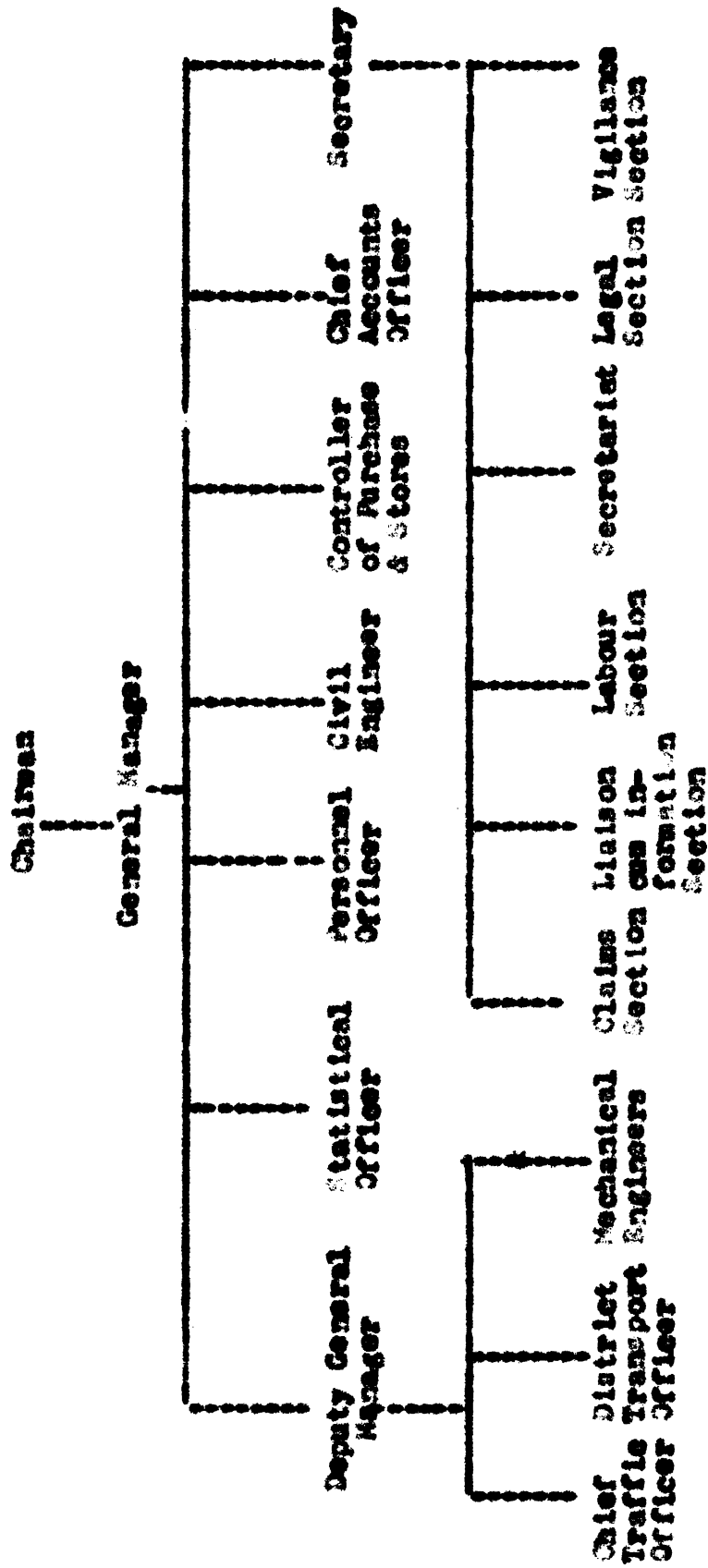


Figure 5.5.

ESBTC ORGANIZATION STRUCTURE - (1976-77)



### The Present Structure

The organisational set up of KERTC at the end of 1980-81 is given in Figure 5.6. The General Manager is the administrative head of the Corporation, who is assisted in the day to day administration by the Secretary, the Deputy General Manager, the Chief Accounts Officer and the Controller of Purchase and Stores. The Personnel Officer, the Assistant General Manager ( Training ), the Assistant General Manager (Vigilance), the Civil Engineer and the Statistical Officer also report directly to the General Manager. The Traffic Branch which is responsible for the operations and the Mechanical Engineering Branch which looks after the workshop and maintenance are coordinated and controlled by the Deputy General Manager.

The overall administration of KERTC is vested with a Board of Management, which consists of nine members, six officials and three nonofficials. Of the official members, four are nominated by the State Government and two by the Railways. The Chairman and General Manager are nominees of the State Government.

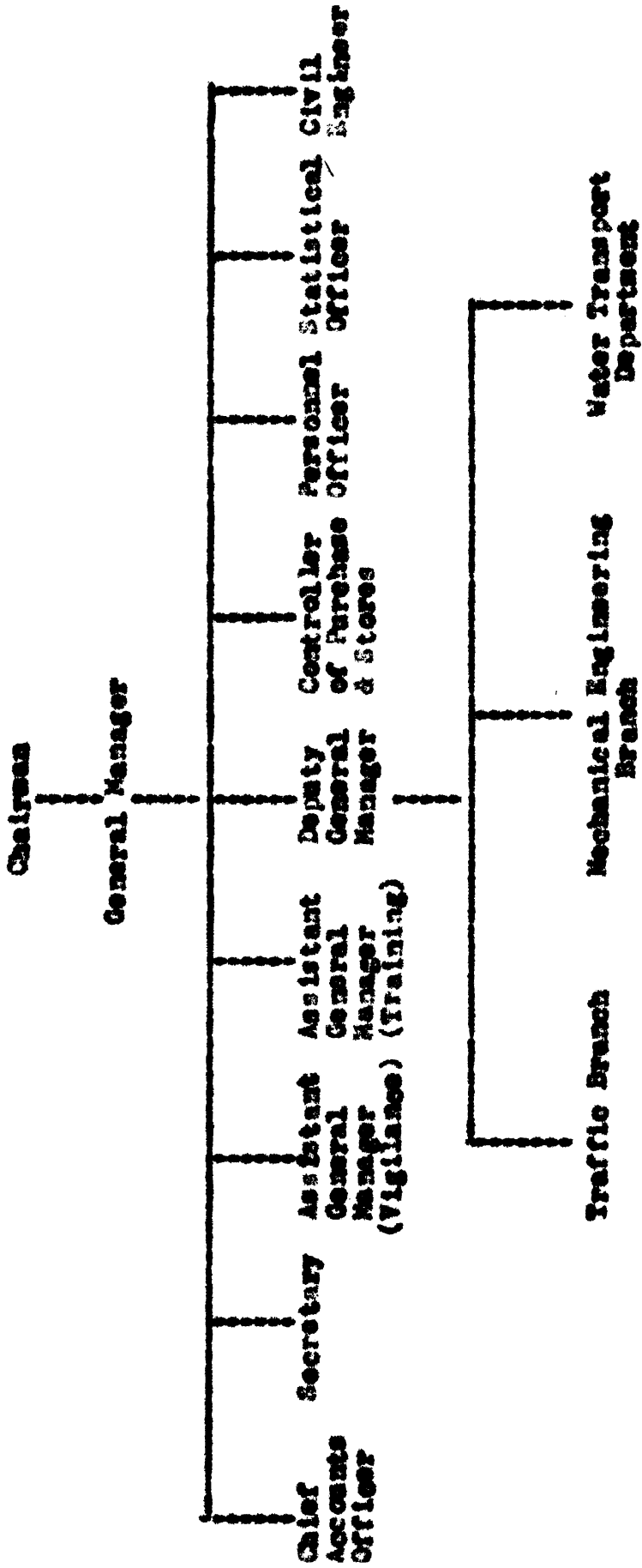
The general administrative set up of KERTC follows a three tier structure, viz.

- (i) Head Office
- (ii) Depots
- (iii) Sub-depots and operating centres.



Figure 5.6

ASRTC ORGANIZATION STRUCTURE - (1990-01)



The head office located at Trivandrum is responsible for the overall control and coordination. The various operating units are divided into Depots, Subdepots and Operating Centres and the actual responsibility for the operation of schedules rests with these units. The Subdepots and Operating Centres are under the supervision and control of Depots. At the time of its formation, there were altogether ten Depots and two Subdepots under the Corporation. With the expansion of operation new units came into existence and as on 10.3.1982 there were 24 Depots, 12 Subdepots and 7 Operating Centres.<sup>3</sup>

The maintenance organisation of the Corporation consists of a central workshop at Trivandrum, four regional workshops at Calicut, Edappal, Alwaye and Havelikkara, five divisional workshops at Trivandrum, Kottayam, Alleppey, Ernakulam and Alwaye and Depot and Subdepot workshops attached to all Depots and Subdepots. For proper coordination and control the workshops under the Corporation are grouped into Northern and Southern regions, each region under the control of a mechanical engineer. The immediate administrative control of the Divisional, Depot and Subdepot workshops is exercised by the District Transport Officer or the Assistant Transport Officer concerned.

The organisation and set up of purchase and stores section will be dealt with later.

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<sup>3</sup> See Appendix - IX for a list of Depots, Subdepots and Operating Centres.

### Analysis of the Overall Set up in KSRTC

The present organisational set up of KSRTC follows a functional form of departmentation at the top management level. The different sections are organised on the basis of their functions such as traffic, stores & purchase, maintenance etc.

The area of operation of KSRTC extends over the entire state ( and even outside ). Although areawise Kerala is a small state, its total length from north to south , a distance of about 550 kilometres, is quite comparable to that of any big state in the country. Hence coordination and control of the entire operation of KSRTC from the head office at Trivandrum which is way down in the Southern part of the state may sometimes pose certain problems. This indicates the need for strengthening the general administrative set up on geographical basis. There are at present 43 operational units each under a District Transport Officer/ Assistant Transport Officer/Inspector Incharge supervised and controlled by the Chief Traffic Officer. But they do not form a wellknit administrative set up. There is very little decentralisation of authority to the DTOs/ATOs. These officers have come up from the lower ranks of conductors,

drivers, checkers, clerks etc. By and large, they do not possess any managerial abilities.

Another defect of the existing set up follows from the reporting relationships of the three primary functions of traffic, maintenance & purchase/stores. These three functions are highly interdependent and their proper coordination is required for operating the transport services effectively.

In the present set up the heads of traffic and maintenance functions report to the Deputy General Manager, whereas the Controller of Purchase and Stores report directly to the General Manager. This arrangement creates problems of coordination among the three inter-related departments.

Although the overall structure of KSRTC was changed several times since it was formed in 1965, these changes do not seem to have improved the general administrative structure in any way.<sup>5</sup> The organisational set up has not been geared to cope up with the considerable expansion of the Corporation in terms of number of schedules and area of operation. These changes were mainly aimed at regrouping the reporting relationships at the top management level, as could be seen from the preceding discussions.

4 To quote from Kunjukrishna Pillai Award, "I think it is very necessary to recruit persons directly to certain posts, particularly in the position of DTCs. The post is a King pin in the organisation which requires supervisory and managerial capacity of a very high order". Chapter 25 of the Award, KSRTC, Trivandrum, 1972.

5 Committee on Road Transport, op.cit. p.150.

Before suggesting any changes in the existing structure, it is necessary and useful to survey the organisational practices in other comparable STUs.

### Overall Organisational Set up in Other STUs.

#### 1. Karnataka SRTC.

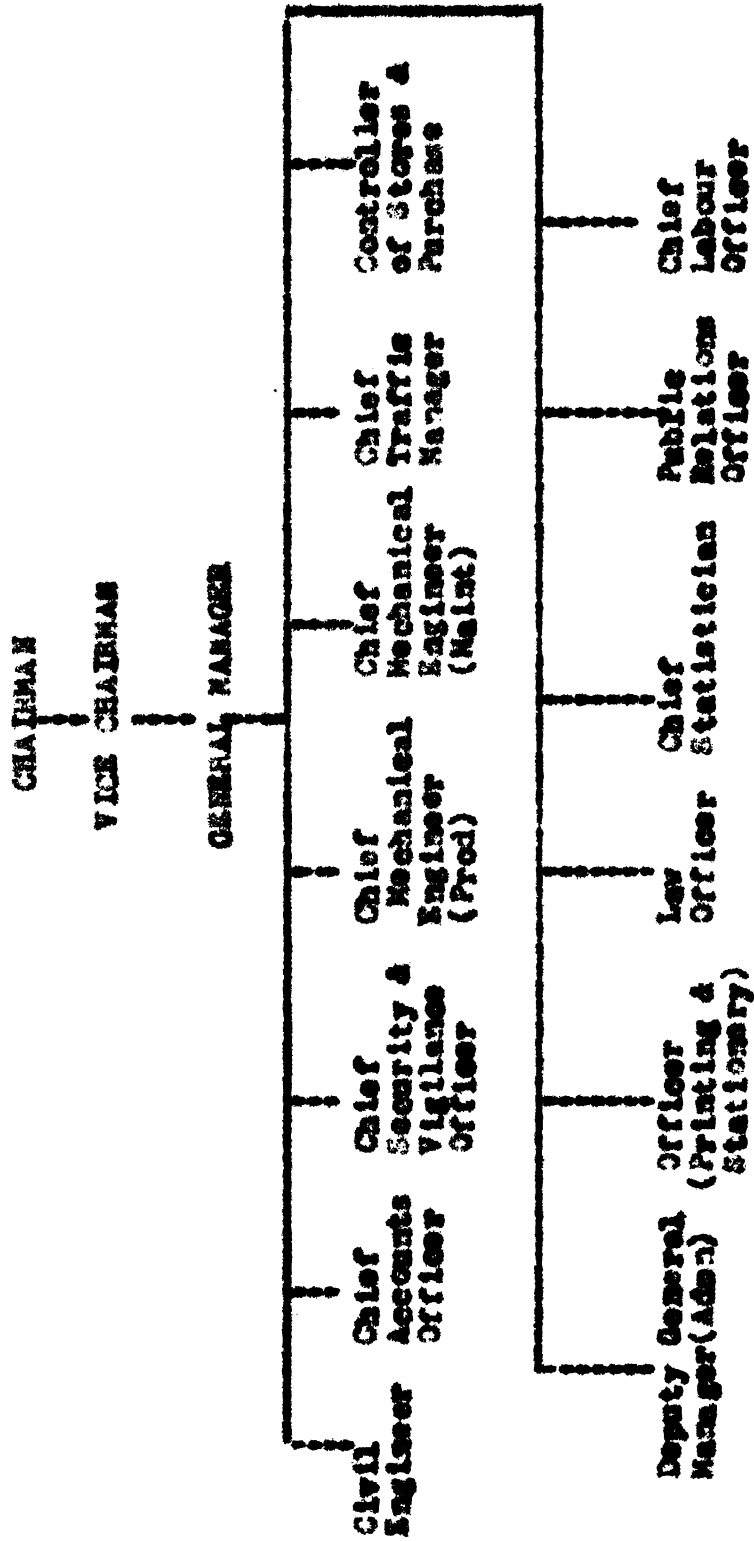
The general administrative set up of Karnataka SRTC can be broadly divided into three distinct levels of management, namely,

- (a) Head Office
- (b) Divisional Office
- (c) Depot Office

The head office of Karnataka SRTC located at Bangalore is responsible for the total organisation in all respects. The 67 depots of the Corporation are administered by 12 divisions which are responsible for the bulk of the administrative work of the depots. The fleet strength in these divisions varies from less than 200 to 700 vehicles. There are five divisions with a fleet strength between 400 and 700 vehicles and in another five divisions the strength is between 200 and 400 vehicles. In the remaining two divisions, the number of vehicles is less than 200.

The organisational structures of Karnataka SRTC at head office and at divisional levels are shown in Figures 5.7 and 5.8 respectively.

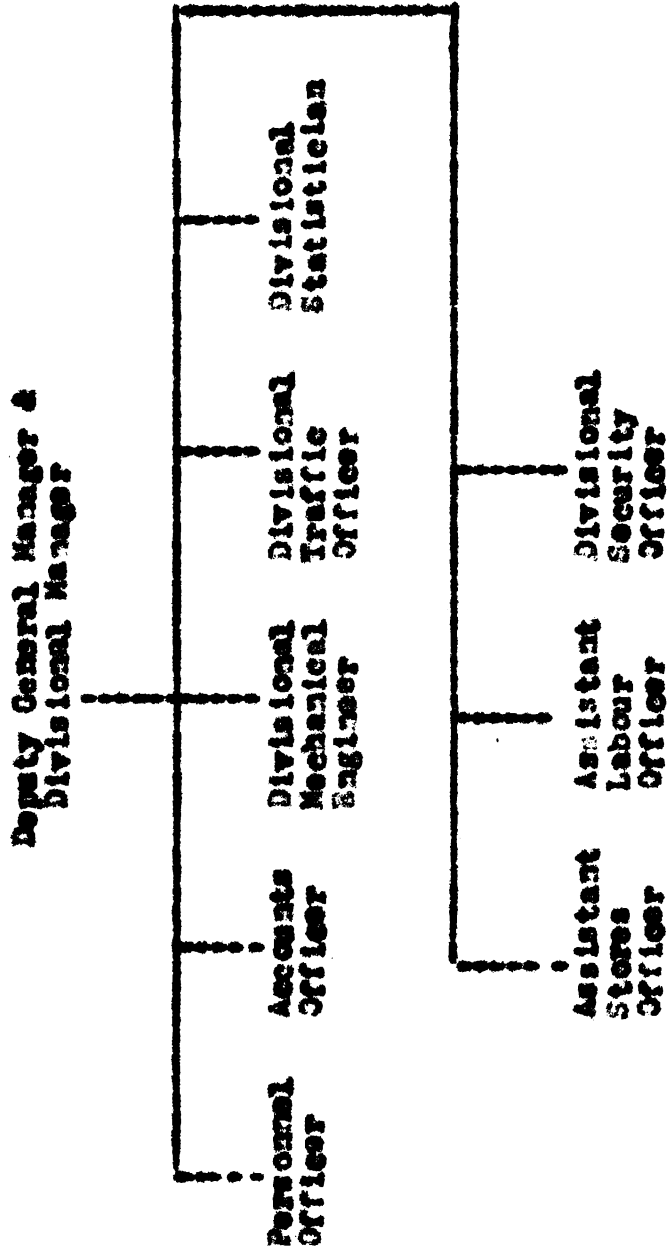
**FIGURE 5.7**  
**SET UP OF KANASAKA BRIG. HEAD OFFICE**



**Note :** All the heads of departments report directly to the General Manager. Depending on the nature and volume of work, some departments have Class I selection grade officers whereas other departments have Class I senior grade officers as head of the departments.

FIGURE 5.8

SAHARA TANKA SEC. DIVISIONAL SET UP



## **2. Andhra Pradesh SRTC**

The Andhra Pradesh SRTC with a fleet strength of 7,000 vehicles is the second biggest state transport undertaking in the country. The total administrative set up of the Corporation comprises four distinct levels, viz.

- (a) Head Office level
- (b) Regional level
- (c) Divisional level
- (d) Depot level

The head office deals broadly with policy matters, whereas the routine administrative work is performed by the regional managers. The departmental heads at the head office in effect act as staff specialists since the bulk of the line management work is handled by the regional managers. The posts of departmental heads and regional managers are inter-transferable and this has resulted in better understanding and greater coordination amongst the top management group.

The Corporation is divided into five independent regions for better administrative control and increased efficiency. The average fleet strength of regions varies from 1200 to 1700 vehicles except in one region which has only about 800 vehicles. All the regions are provided with adequate maintenance and stores set up including tyre retreading plants.



All the regions have separate training schools also where the drivers, conductors and other staff members are trained.

The regions are further divided into convenient divisions for better operational control and coordination. Presently there are 18 divisions, with a fleet strength varying from 230 to 600 vehicles. A divisional office, in reality, does not represent a full-fledged administrative tier of APSRTC, since the divisional manager has neither a divisional workshop nor a divisional store exclusively. The total staff in a divisional office is hardly 10. The basic function envisaged from a divisional manager is regular inspection and monitoring of performance of depots for proper implementation of the policies of the Corporation and for rendering guidance to the depot managers.

Each division consists of 4 to 6 depots which are the basic operational units. Presently there are 107 depots in APSRTC, with an average fleet strength of about 60 vehicles in each.

The organisation structures of APSRTC at the head office and regional level are given in Figures 5.9 and 5.10 respectively.

**Figure 5.9**  
**SET UP ANDRA TRADES BMTG - HEAD OFFICE**

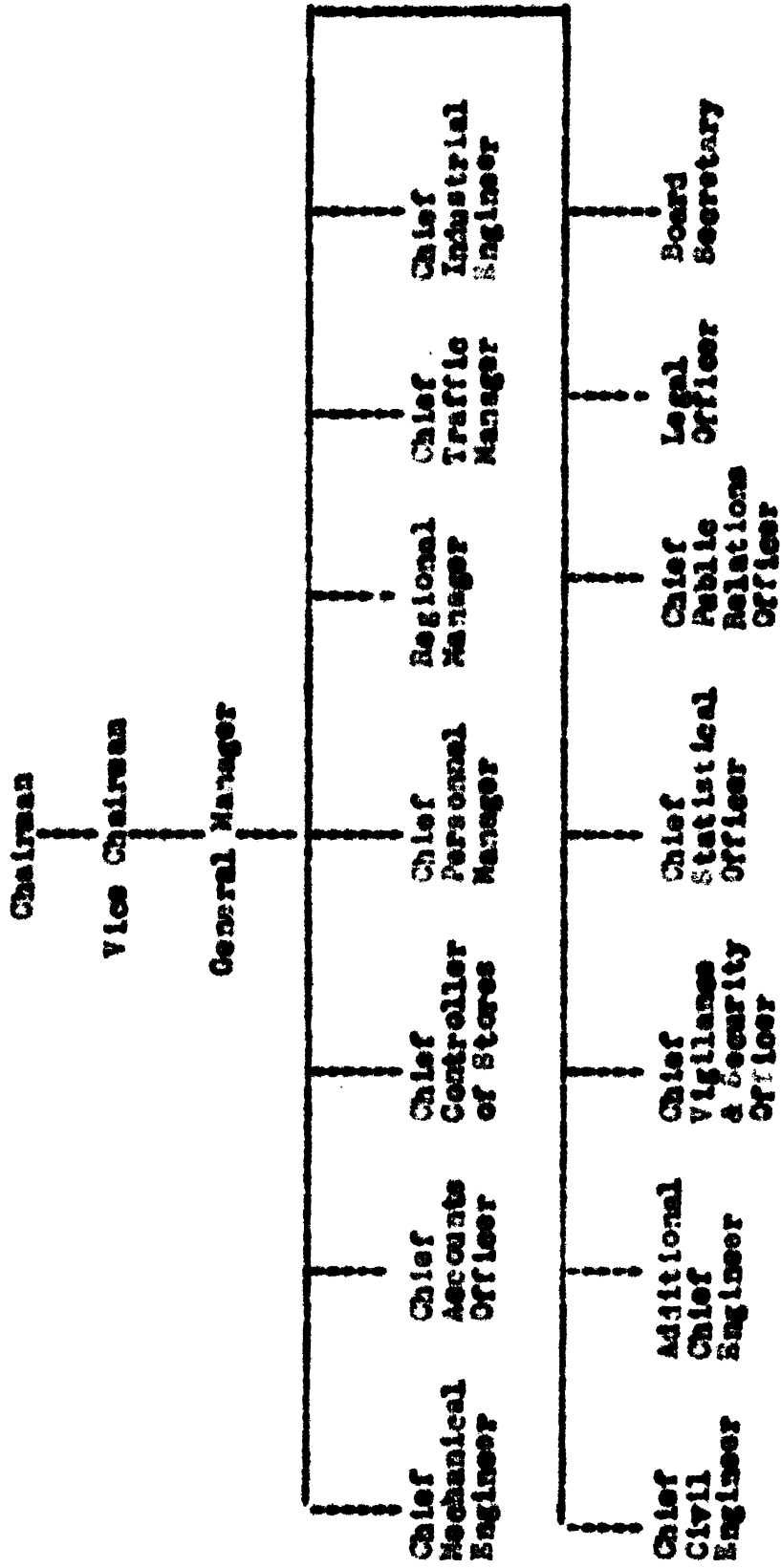
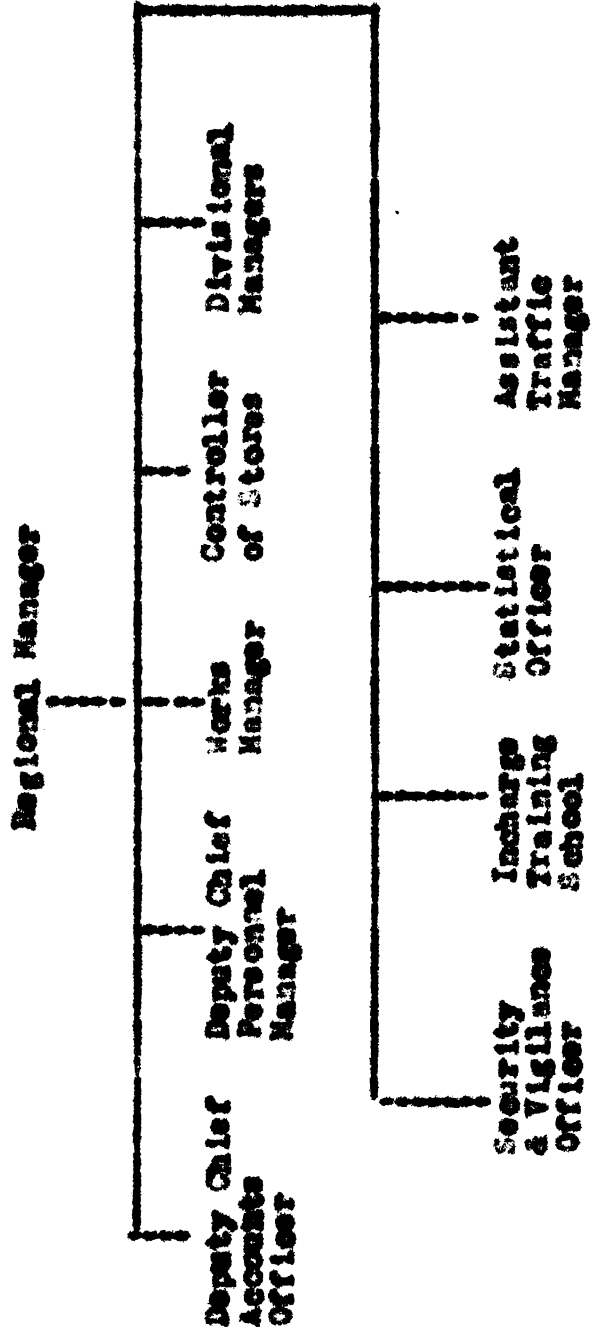


Figure 5.10  
ANDHRA PRADESH SRTC - REGIONAL SET UP



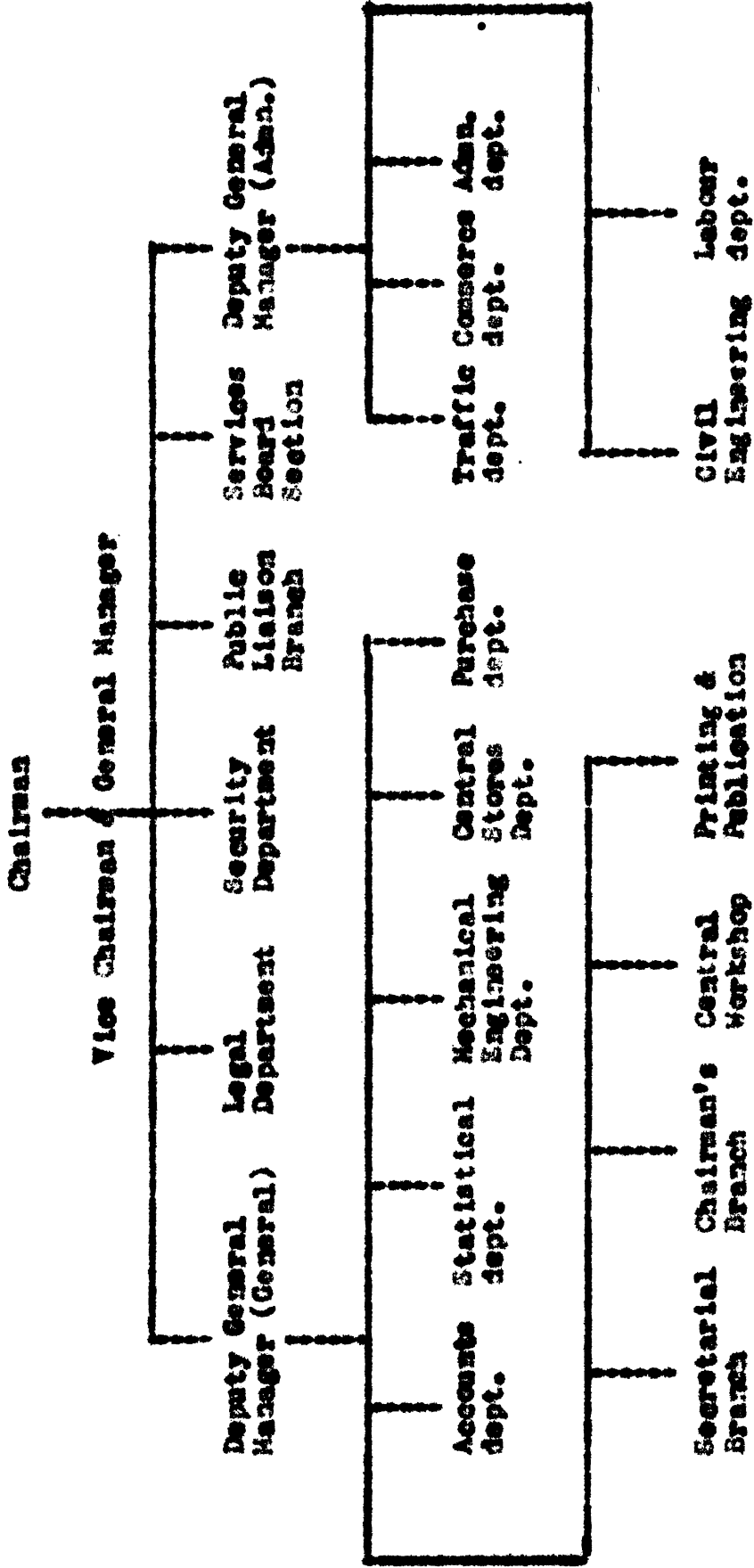
### 3. Gujarat SRTC

The administrative set up of Gujarat SRTC follows a three tier structure of management, with a head office, 14 divisions and 112 depots. The organisational set up at the head office is given in Figure 5.11.

The divisional offices, each of which controls the operations in a given area, are headed by Divisional Controllers. They are provided with adequate assistance in different functional areas such as engineering, traffic, stores, accounts and personnel. The performance of the division is reviewed by head office every month and guidelines are issued periodically to achieve corporate objective.

The divisions are further divided into depots which are the basic operating units. The depots are headed by Depot Managers who are provided with adequate staff in engineering and traffic sides to carry out the functions at the field level. The depots are classified depending upon the fleet strength and the number of schedules operated.

Figure 5.11  
SET UP OF GUJARAT SHIC - HEAD OFFICE



#### **4. Maharashtra SRTC.**

MSRTC with a fleet strength of more than 9000 vehicles, is the biggest state transport undertaking in the country. The administrative set up of MSRTC follows a four tier structure with central office, operating regions, divisions and depots. At the end of 1979, the Corporation had four operating regions, 26 divisions and 166 depots.

#### **General Analysis of Organisational Set up.**

Analysis of the organisational set up in these and other state transport undertakings in the country shows, by and large the following pattern :

1. A four tier administrative set up with central office, regions, divisions and depots, is followed by the two largest STUs namely Maharashtra SRTC and Andhra Pradesh SRTC.
2. Three tier set up is followed by undertakings like Gujarat SRTC, Karnataka SRTC, Madhya Pradesh SRTC, Rajasthan SRTC, Uttar Pradesh SRTC, etc. These undertakings generally operate over a vast area, have a fairly large fleet - 2000 or more vehicles and run both district and city services.
3. Two tier set up consisting of depots and headquarters, usually prevails in city transport undertakings, departmental or company type organisations and

undertakings having only a small fleet. Examples of organisations falling in this type of set up include Meghalaya SRTC, Pallavan TGL, Ahmedabad MT, Poona MT, Nagaland ST, Cholan RWCL, Pandiyan RWCL, etc.

4. Departmentation at top management level is on functional basis in city and in small undertakings and a combination of functional and geographical basis in the large undertakings.
5. Large state transport undertakings generally have a wide span of control, ranging upto 15 or more managers reporting directly to the Chief Executive. Examples include Andhra Pradesh SRTC and Karnataka SRTC.

As described earlier, Kerala State Road Transport Corporation follows a three tier structure. It has a large fleet of more than 3000 vehicles, and operate both district and city services. Its area of operation extends from Cape Comerin in the south to Kasargod in the north - a distance of about 550 kilometres. Hencefor better administrative control and coordination it would perhaps be desirable to further strengthen the three tier set up in this Corporation. This set up may be based on the following guidelines.

1. The three tier system consists of depots, divisions and head office.

2. Depots could be the basic operating units, for incurring costs and earning revenues and profits for the undertaking.
3. The Depot Manager may be the executive head of a depot. He may be assisted by staff members in the traffic, mechanical, engineering, stores, accounts and statistical sections for managing the transport services. He would report to the Divisional Manager.
4. Depots may be classified into A, B or C categories depending upon the number of schedules and/or the number of vehicles operated. The facilities and staffing pattern may be varied for the different categories of depots.
5. The depots may be grouped into divisions on the basis of their proximity and administrative convenience. A division would therefore represent an administrative unit for supervision, coordination and control of the activities of a number of depot located in an area. The existing depots, subdepots and operating centres in KSRIC may be grouped into 3 or 4 divisions.
6. A division would be headed by a Divisional Manager who would report to the Deputy General Manager for overall functions. He would also obtain guidance from



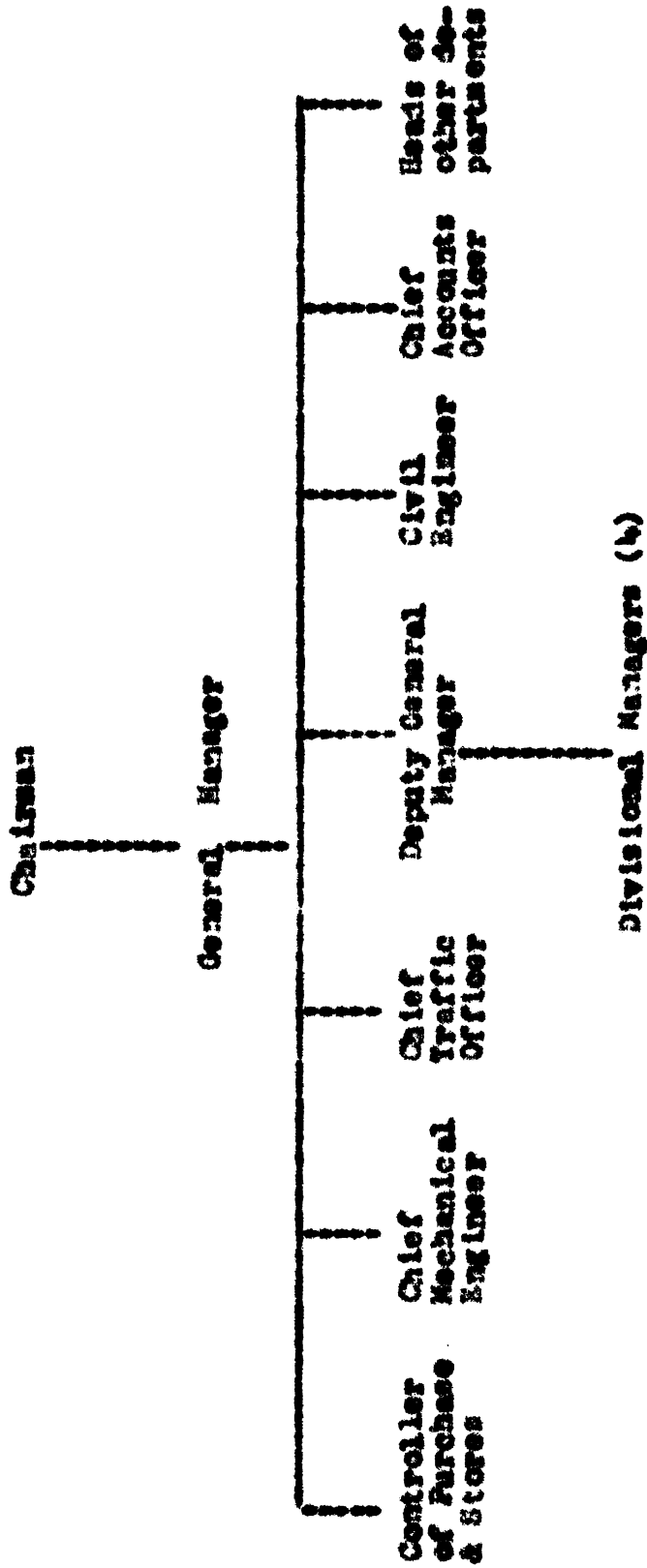
the staff officers located at head office. The Deputy General Manager would coordinate the operations of all the divisions.

7. The Divisional Manager would be assisted by traffic officer, mechanical engineer, stores officer, accounts officer, labour officer and a statistician, in the discharge of his functions.
8. There would be greater decentralisation of authority for decision making at the divisional level. Most of the routine administrative functions would be performed at depots and divisional levels. The central office would be responsible for the overall supervision, coordination and control of the divisions. It would frame the broad policies in personnel, purchasing and other matters and formulate the long term objectives and plans of the enterprise. The heads of the departments at the central office would primarily act as advisors to the divisional managers in their respective functional areas.

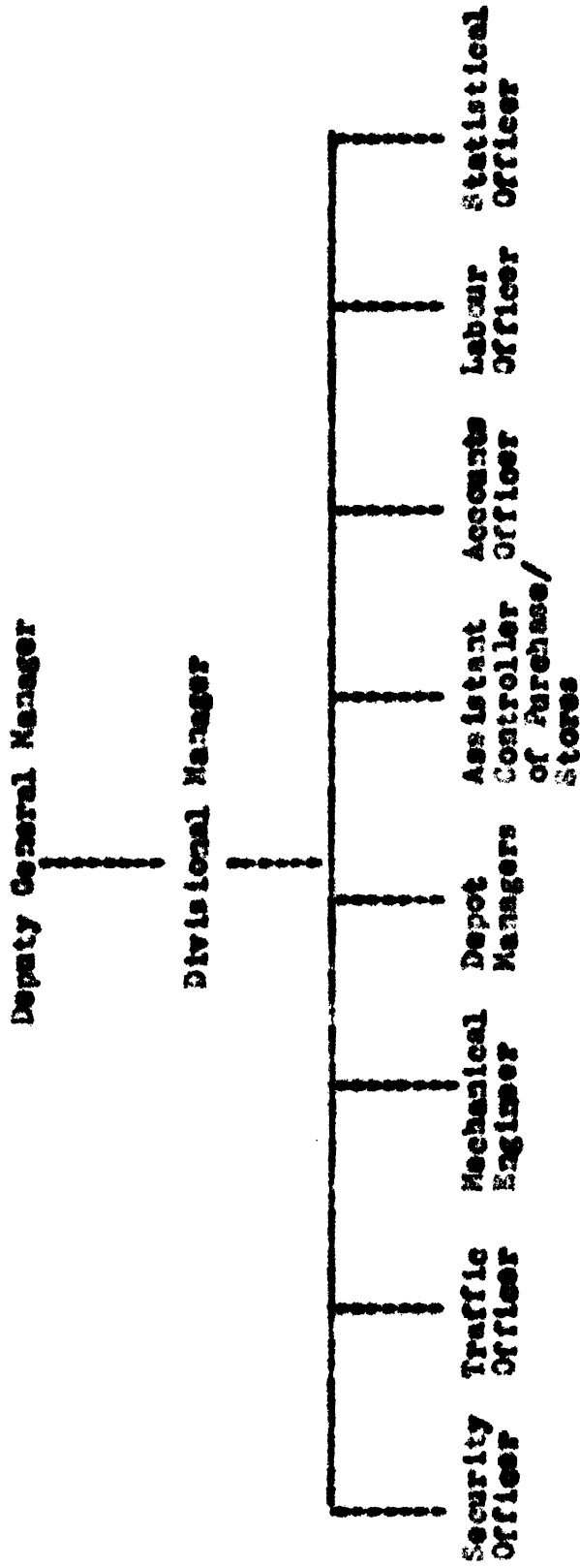
A top management structure prepared on the basis of the above guidelines is presented in Figure 5.12. The proposed organisation structure at the divisional level is given in Figure 5.13.

Figure 5.12

PROPOSED ORGANIZATION STRUCTURE FOR KERIC ( CENTRAL OFFICE )



**Figure 5.13**  
**PROPOSED DIVISIONAL SET UP IN KSEIC**



The above structure, it is hoped, would help to rectify some of the defects in the existing organisational set up as indicated earlier. The following are some of the salient features and advantages of the proposed structure over the existing one.

1. This proposed structure provides for 4 divisions with greater decentralisation of authority. These divisions would be provided with adequate supporting staff and facilities. They would be made responsible for the performance of depots under them. Since each division has only a few depots and limited geographical area, they would be able to properly plan, schedule and coordinate the various functions of transport management in their divisions.
2. Since the entire state passenger transport services are to be organised under three or four independent divisions, there can be several areas of conflict among the various divisions. Hence sorting out the areas of friction and effectively coordinating the activities of the divisions assume great significance. This will be facilitated by the divisional managers reporting to one Deputy General Manager who will supervise and coordinate the divisional managers.
3. The heads of Purchase & Stores, Maintenance and Traffic would be reporting to the same level and hence coordination among these functions would be facilitated.

4. This structure combines departmentation on the basis of function as well as geographical area at the top management level.

### Importance of Materials Management Organisation

The state passenger transport undertakings provide transportation service to the public through a transformation process, as explained earlier in this chapter. Units of transportation service offered can be measured in terms of seatkilometres.<sup>6</sup> The task of transport undertaking is to produce and supply adequate number of seat kilometres economically in different routes in the desired manner and time.

Three key functions can be identified in this operations management situation of a passenger transport undertaking.

They are :

1. To provide or make available adequate number of clean, comfortable and reliable vehicles.
2. To market the product - seat kilometres along the different routes at the desired timings and to earn the revenue.
3. To procure and supply the materials required for the maintenance and operation of the transport vehicles.

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6 Seat Kilometres ( Route length in kms. X Seating capacity) indicates the extent of service offered while passenger kilometres ( Route length in kms. X No. of passengers travelled ) measures the utilisation of service.

The first function of up-keep and maintenance of the vehicles is done by the mechanical engineering department in STUs. It provides technical service by proper design, development ( body building ) and maintenance of vehicles. The second function of planning, scheduling and operating the vehicles is performed by the traffic department. It provides the transportation service according to plans, policies, standards, and specifications devised to perform the conversion as effectively and efficiently as practical. The last function of procuring, stocking and supplying materials is undertaken by the materials management department or what is commonly called as the purchase and stores department in STUs. It controls and coordinates the material supplies, particularly to mechanical engineering and traffic functions, by proper planning, scheduling, procurement, handling, storage, control and timely distribution of materials and supplies to the consuming centres.

All the three functions are closely interrelated and interdependent. Availability of the vehicles and punctuality of operation are largely determined by the efficient management of maintenance and materials functions. The type, quantity and timing of the materials to be purchased and supplied by the materials management department depends upon the requirements of maintenance and traffic departments. In a similar manner, the maintenance department depends on

materials management department for the spare parts and other materials required for maintaining and supplying the vehicles as per the needs of the traffic department. Cooperation and coordination among these three departments is essential for providing the desired level of service economically. This will be easier to achieve when all three functions are recognised at the same level, and emanate from a common leadership so that each can perform to the same set of operations management objectives. It would be necessary then that the materials manager directly reports to and operates on the same level as the heads of traffic and mechanical engineering functions in STUs.

#### Materials Management in the Overall Structure

The organisational position or relationship of the materials management function in the overall set up of a state transport undertaking is dependent on a number of factors. One major consideration is the recognition of the importance of materials management in achieving organisational objectives and the extent to which it contributes to costs, profits and problems. Other factors include the corporate span of control, that is, the number of departments or functions reporting to the top level of management; the size and geographical dispersion of operations; the organisation's centralisation as compared to decentralisation of authority and the corporate policies, practices and personnel.

Every organisation has its individual managerial attitude towards organisation. The problems, the personnel & the environment may also vary from one undertaking to the other. Hence there are varying patterns in the evolution and existing set up of materials management function in STUs.

### Evolution of Materials Management Structure in KSRIC.

It is useful and interesting to study the evolution of materials management organisation over the years in KSRIC. The changes in the top management structure of materials organisation since 1955 when it was only a departmental undertaking, is given below :

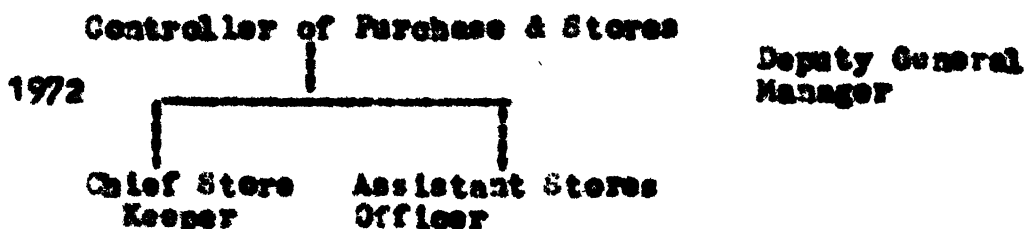
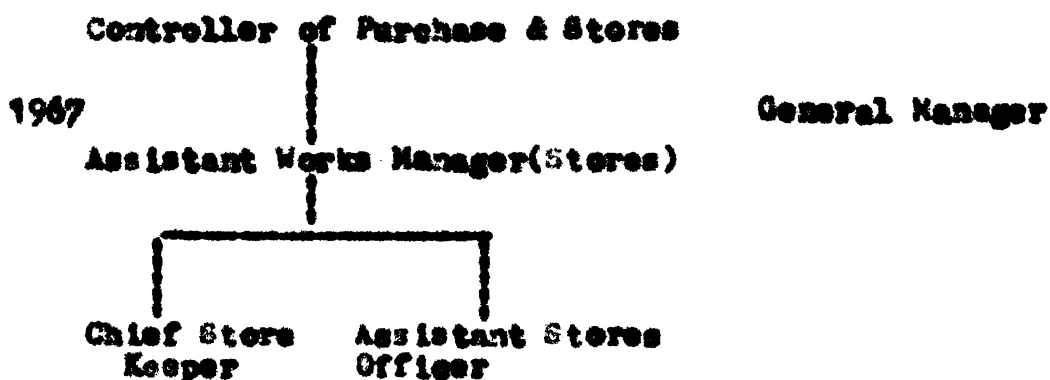
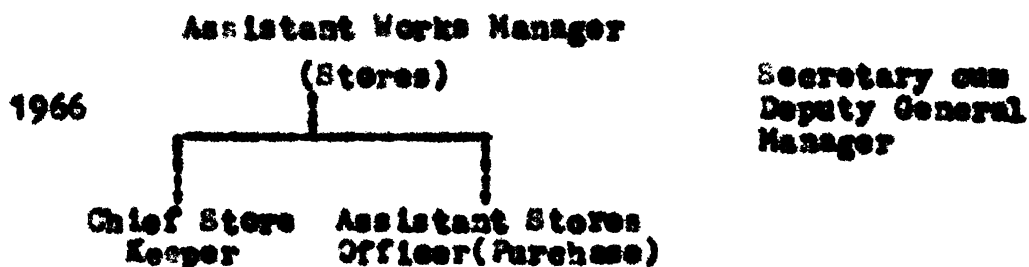
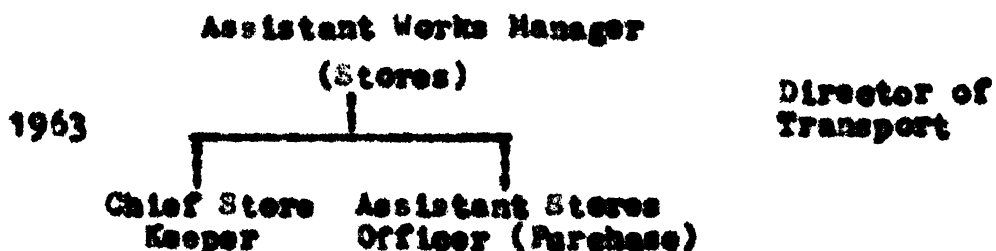
Year	Materials Management Organisation	Head of materials function reporting to
1955	<pre> graph TD     A[Stores Superintendent] --- B[Chief Store Keeper]     A --- C[Purchase Assistant]           </pre>	Financial Assistant equivalent to the Chief Accounts Officer today
1958	<pre> graph TD     A[Stores Officer] --- B[Chief Store Keeper]     A --- C[Assistant Stores Officer (Purchase)]           </pre>	Director of Transport



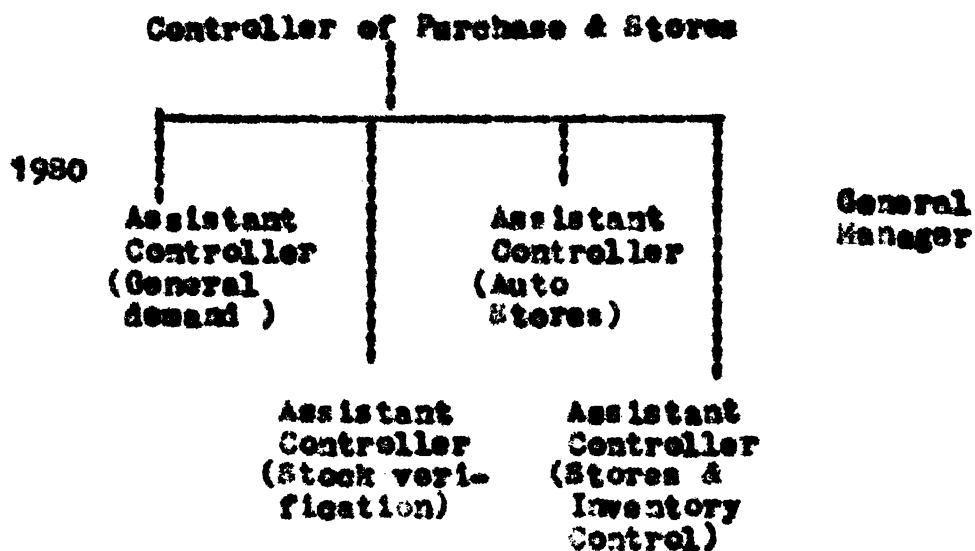
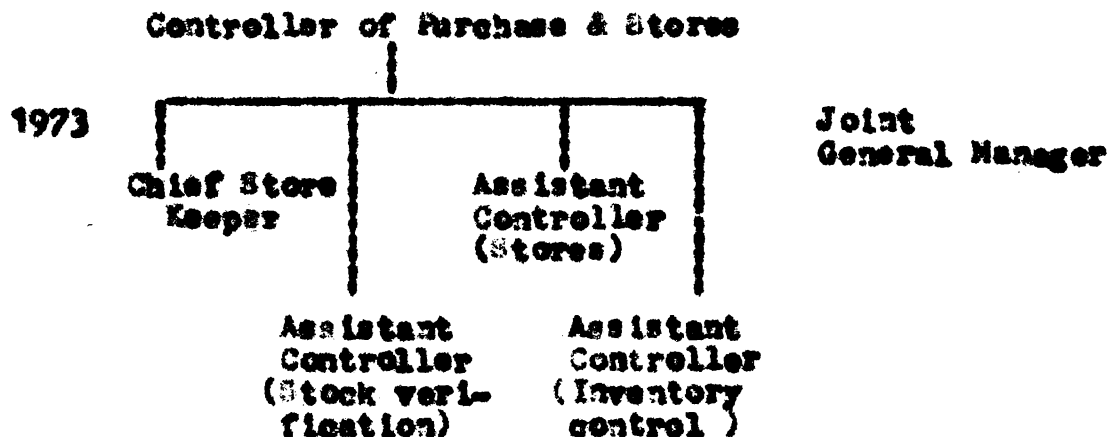
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Year Materials Management Organization	Head of materials function reporting to
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Year	Materials Management Organisation	Head of materials function reporting to
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It can be observed from the above that the designation of the department head, the reporting level and relationships and the internal structure of the materials management department have undergone significant changes during the 25 years. The stores superintendent in 1955, who was in charge

of the purchase and stores wing, has given place to the Controller of Purchase and Stores. The reporting level has also gone up from Financial Assistant in 1955 to the General Manager, the chief executive of the undertaking as at present. The internal structure has been reorganised and strengthened to cater to the different specialised functions and item categories.

The evolution of materials organisation in KERTC shows that all the major functions of materials management such as purchasing, store keeping and inventory control were unified and placed under one officer since 1955. During the initial period this section was headed by a relatively junior officer. But immediately after the formation of the Corporation, the need for upgrading the status of materials function was recognised. "It was felt that better efficiency could be had if a sufficiently senior and experienced officer is placed in overall charge of the purchase and stores wing of the Corporation. Accordingly, a new post of Controller of Purchase and Stores was created.<sup>7</sup> Since then, there has not been any change in the designation of the head of materials management function in KERTC.

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<sup>7</sup> Kerala State Road Transport Corporation, Annual Administration Report for the year 1967-68, KERTC, Trivandrum, p.9.

### Present Set up

The purchase and stores wing in the ERIC is headed by the Controller of Purchase and Stores, who reports directly to the General Manager. This was shown in Figure 5.6.

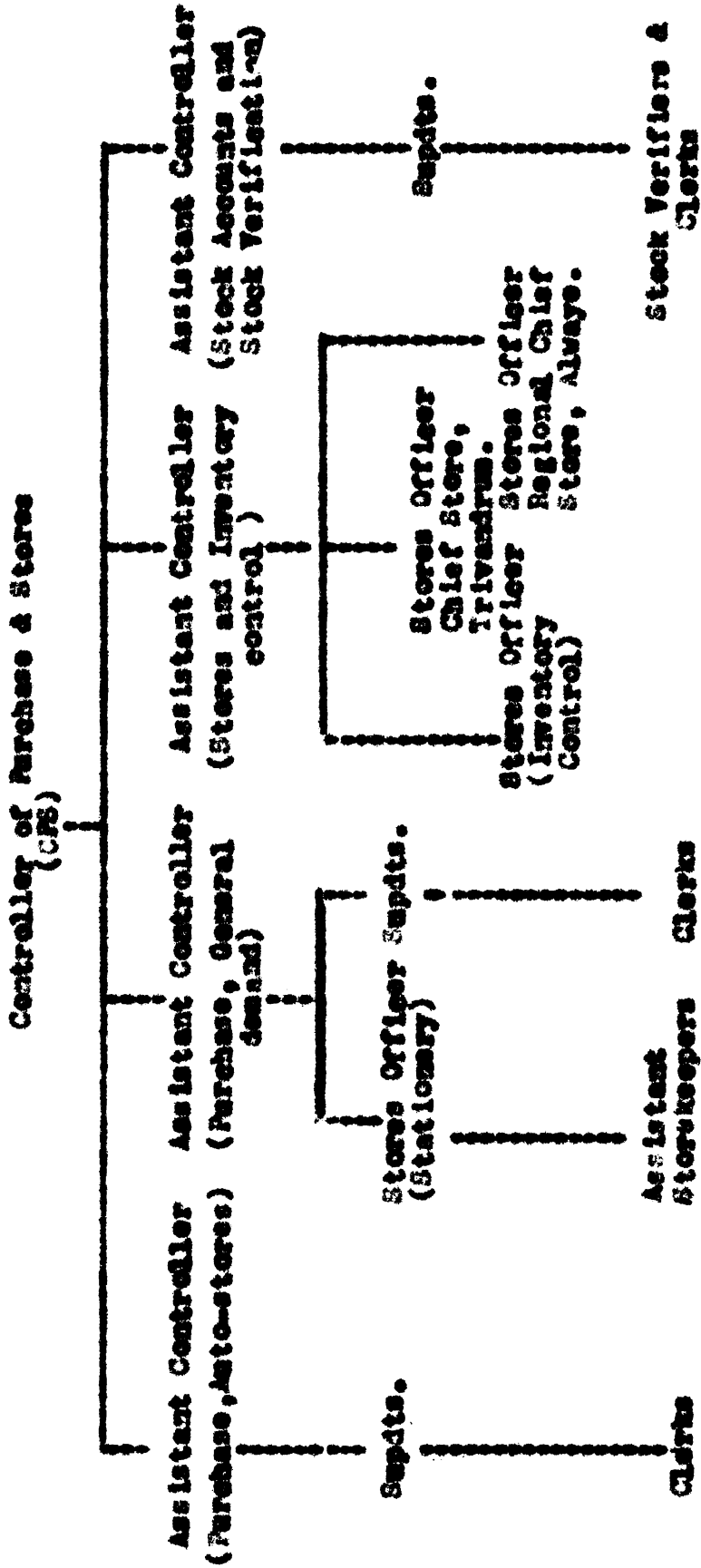
The major functions of the department are :

1. Purchasing,
2. Store keeping and Inventory Control, and
3. Stock Accounts and Stock Verification.

The Controller of Purchase and Stores is assisted in these functions by four Assistant Controllers of Purchase and Stores. Since most of the purchase matters are centralised at the chief office level there are two Assistant Controllers dealing with the purchase of materials - one for auto stores and the other for general demand items. The remaining two Assistant Controllers look after stores and inventory control and stock accounts and stock verification functions. The overall set up of Materials Management department in ERIC is shown in Figure 5.14.

Figure 5.94

MATERIALS MANAGEMENT STRUCTURE - OVERALL SET UP



### Organisation of Stores

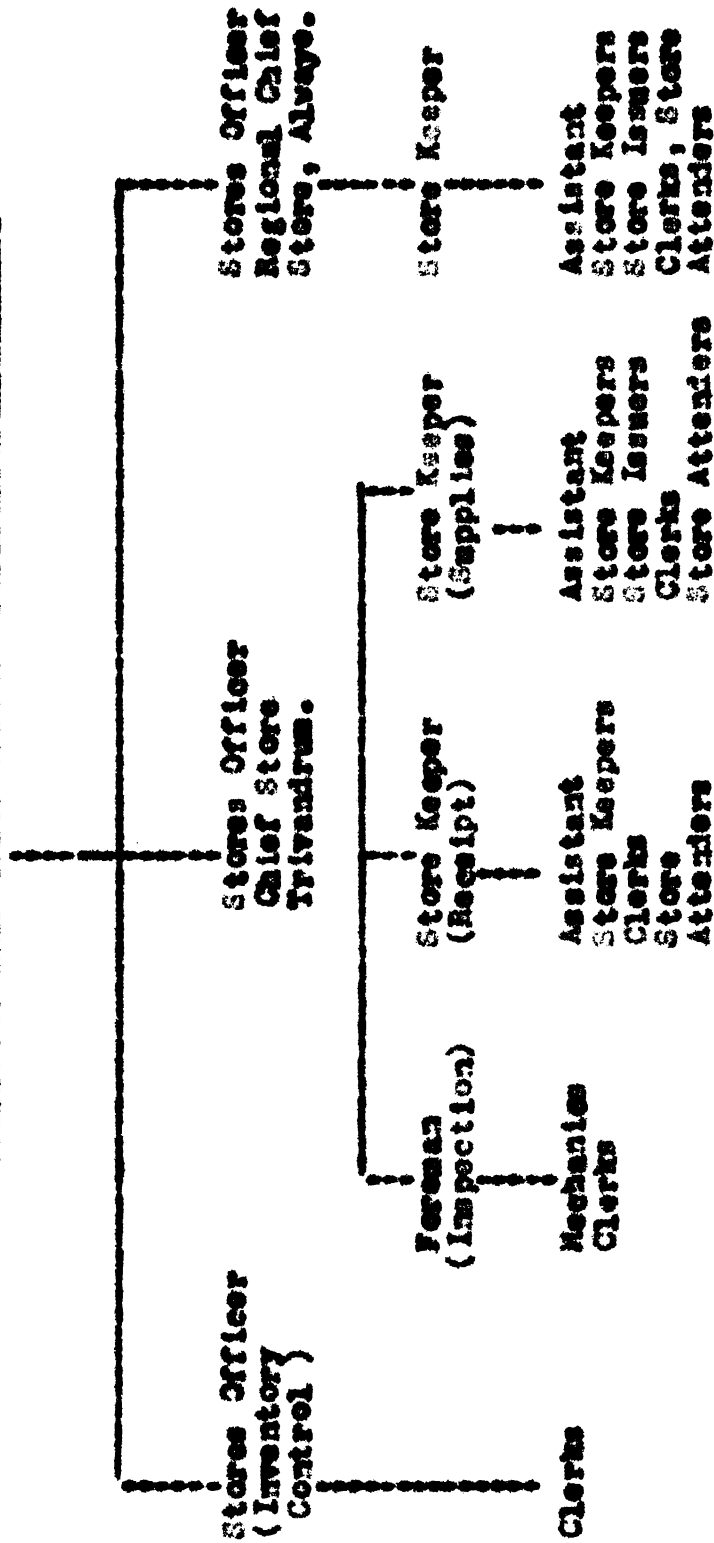
The KSRTC has a well-knit stores organisation consisting of the Chief Store at Trivandrum, Regional Chief Store at Alwaye and sub-stores attached to the operating units. Besides, in the central and regional workshops there are sub-stores dealing with tyres, reconditioned items, etc. Altogether there are now 45 sub-stores including 24 depot stores, 12 sub-depot stores, and 9 workshops stores. The Chief Store at Trivandrum functions as the central store and at the same time as the regional store for the southern part of Kerala. It issues materials to the Regional Chief Store, Alwaye and also directly to the sub-stores in the southern region. Regional Chief store, Alwaye obtains materials from the Chief Store and caters to the sub-stores in the northern region.

The Chief Store, Trivandrum, Regional Chief Store, Alwaye and the Inventory Control Section at the Chief Office are under the direct control and supervision of the Assistant Controller ( Stores and Inventory Control ). This is shown in Figure 5.15.

Figure 5.15

STORES ORGANISATION

Assistant Controller ( Stores and Inventory Control )



**Weaknesses of the Present Set up**

1. It may be observed that in the existing structure, Controller of Purchase and Stores reports directly to the General Manager while the heads of mechanical engineering and traffic functions report to the Deputy General Manager. As explained earlier better coordination and cooperation among these key functions would be possible when the heads of all the three sections operate at the same level and report to the same manager.
2. Purchase and stores are essentially centralised and there is very little delegation of authority for purchase, to the Regional Chief Store, Alwayse and to the various workshop and depot stores. This creates several problems like unnecessary handling, transporting, and other delays since the supplies are routed through the Central Store, Trivandrum. It also results in shortages and delays in replenishing the stock at sub-stores, resulting in increased vehicle down time.
3. Guiding and supervising the working of the sub-stores becomes difficult from the head office, in the absence of any senior purchase and stores personnel in the operating regions. This is also because of the existing weak general administrative set up. The District Transport Officers and Assistant Transport Officers in the



operating units are not generally competent to give any guidance in the organisation and control of these sub-stages.

4. KERTC does not seem to have recognised that materials management is a specialised function requiring certain specific knowledge, skills and attitudes for the personnel manning this department. It was observed that the post of Mechanical Engineer and Controller of Purchase and Stores were considered inter-transferable posts and quite often they were transferred accordingly.
5. The value of the modern techniques of inventory management in effecting reduction of materials costs without impairing the service levels, has also not been adequately recognised. As most of the existing officers in purchasing and stores wing have come up from the lower ranks in the organisation, they do not develop competence to take advantage of the modern inventory management methods.

The existing structure of materials management in KERTC will have to be modified to suit the regional set up of the general administrative organisation proposed earlier. The above mentioned weaknesses also must be rectified in order to improve the efficiency and effectiveness of the materials management organisation. Before attempting this, it is useful to study the set up of material management department in other comparable STUs.

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8 See Figures 5.12 and 5.13.

## Materials Management Organisation in Other STUs

### I. Karnataka SRTC

The Controller of Stores and Purchase is the head of the materials management department. He reports directly to the General Manager along with the heads of mechanical engineering, traffic and other major functions. The Controller of Stores and Purchase is assisted by two deputy controllers, one for the stores and the other for the purchase. The materials management set up at the headquarters is shown in Figure 5.16. Purchasing function is essentially centralised at the head office. The purchase section is responsible for procurement of the annual requirements of all operating units, regional workshops, printing press and the head office.

The stores organisation in Karnataka SRTC follows a 3 tier structure, with one central store, 12 divisional stores and 65 depot stores. Besides, there are two stores attached to the Regional Workshops at Bangalore and Hubli. The Central Store normally does not keep stock of items excepting those of a highly critical nature or imported items. The depots are also allowed to stock only limited number of items. Thus the major stocking points are the Regional Workshop Stores and Divisional Stores. Figure 5.17 presents the structure of a divisional store in Karnataka SRTC.

**Figure 5.16**  
**MATERIALS MANAGEMENT SET UP, IHBARANTAKA BRIG**

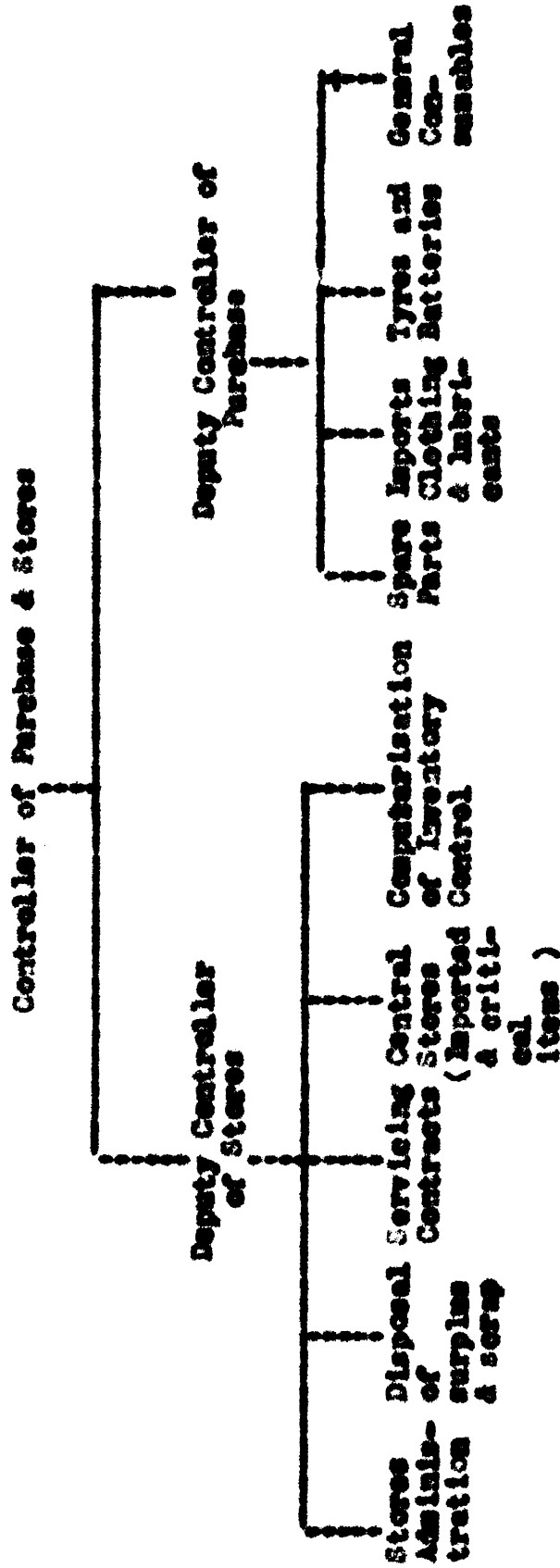
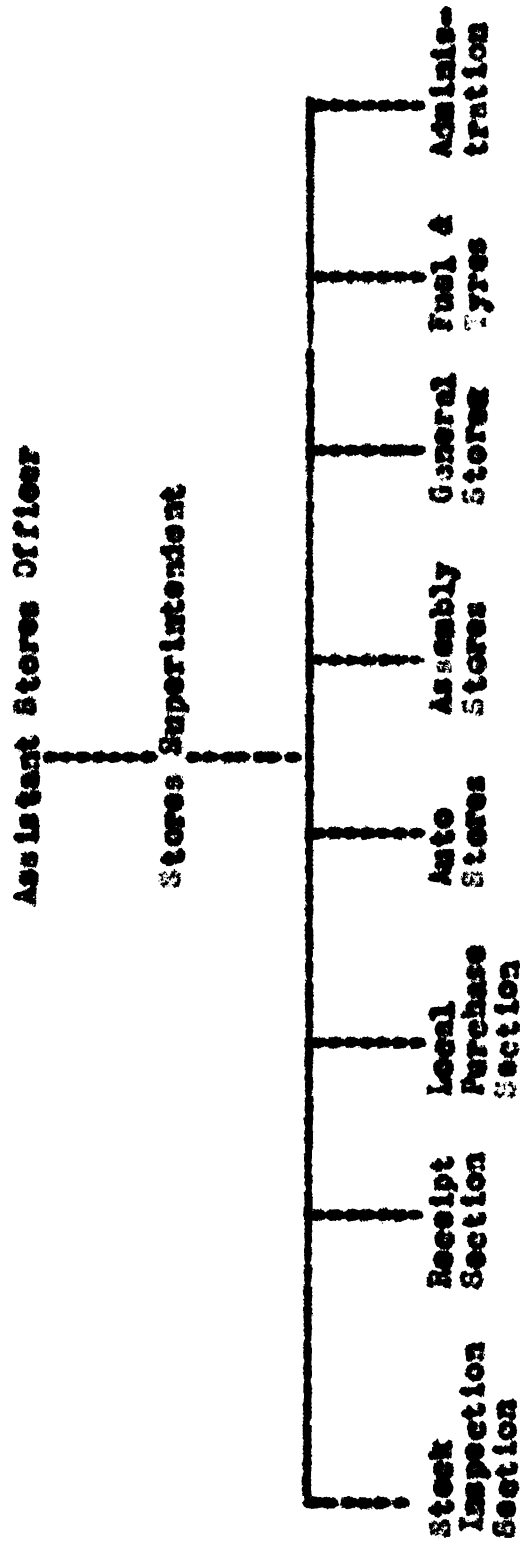


Figure 5.17

ORGANIZATION OF A DIVISIONAL STORE



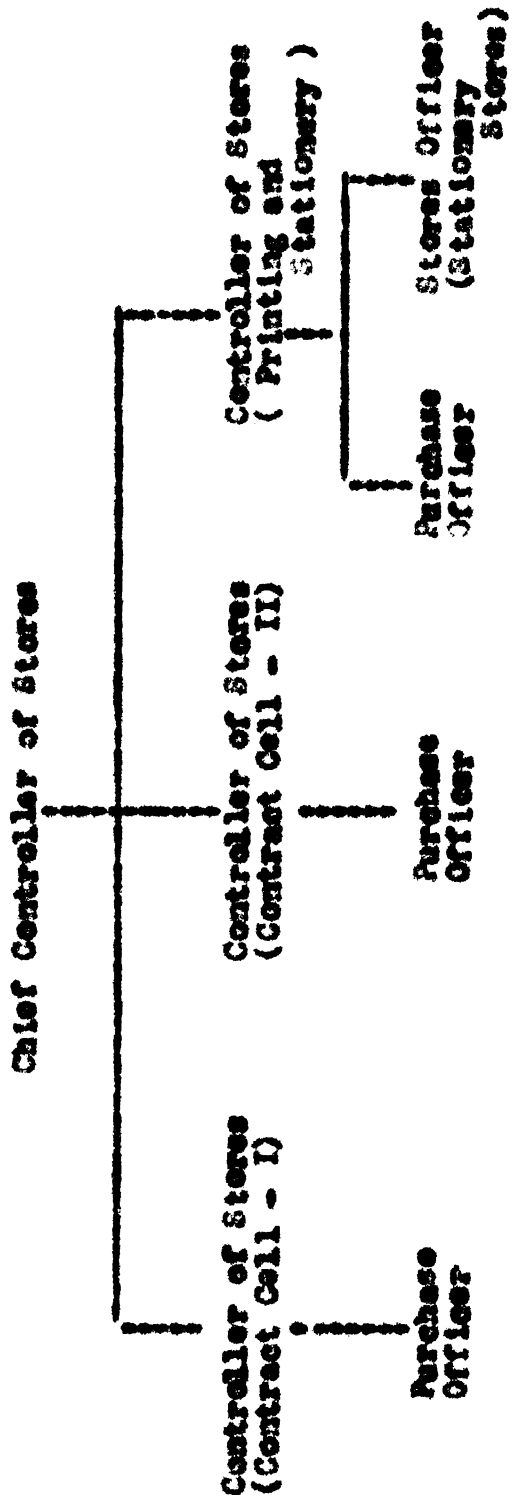
## II. Andhra Pradesh SHIC

The head of materials management organisation in APERTIC is the Chief Controller of Stores, assisting and advising the General Manager on all materials management aspects. He reports to the General Manager alongwith the heads of mechanical engineering, traffic and other functions. The Chief Controller of Stores is responsible for formulating, implementing and the monitoring of materials management systems, procedures and policies in the Corporation. He is assisted by five Controllers of Stores at the field level ( one each in the different regions ) and three Controllers of stores at the head office. The materials management organisation at the head office is given in Figure 5.18.

Basically, the administrative structure of all Purchase and Stores Department can be identified at three distinct levels, namely, (a) Head office, (b) Regions and (c) Depots. But it may be noted that the functions of purchasing and storekeeping are not necessarily undertaken at all the three levels. Purchasing is carried out only at head office and regional levels except for local purchases at depots. Similarly store keeping, receiving and issuing of materials and stock accounting are undertaken only at regional stores and depot stores. There is no central store in APERTIC. The inspection of incoming materials and disposal action for scraps and unserviceable materials are carried out at regional stores only.

Figure 5.18

MATERIALS MANAGEMENT ORGANIZATION AT HEAD OFFICE - AFMSRG



Controller of Purchase and the Controller of Stores. They both report to the Deputy General Manager ( General ).

Purchasing is mostly centralised at the head office, except for local purchases at depots, divisions and central workshop. The purchase wing is responsible for procurement action from the time the bulk indents are received from stores, till the purchase orders are released. All the subsequent functions like giving delivery schedules, follow up, receipts, storage, inventory control, issues, accounting, disposal of scrap materials, etc. are the responsibilities of the stores department.

The organisation structure of purchase department is given in Figure 5.20.

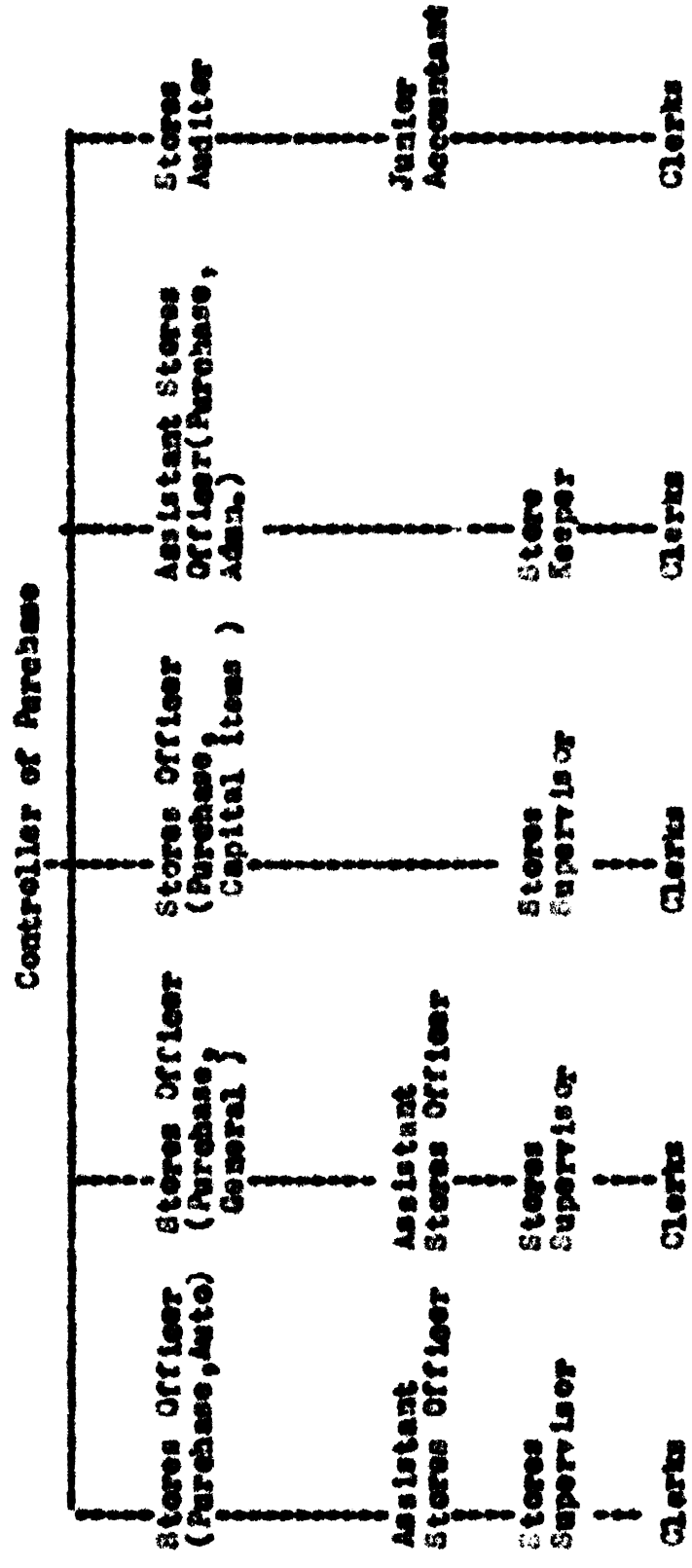
The functioning of the stores department can be broadly identified at three distinct levels, viz.

- (a) Head office level - Controller of Stores
- (b) Central Stores - Deputy Controller of Stores
- (c) Divisional Stores - Stores Officer

The organisation of stores at head office level is given in Figure 5.21.

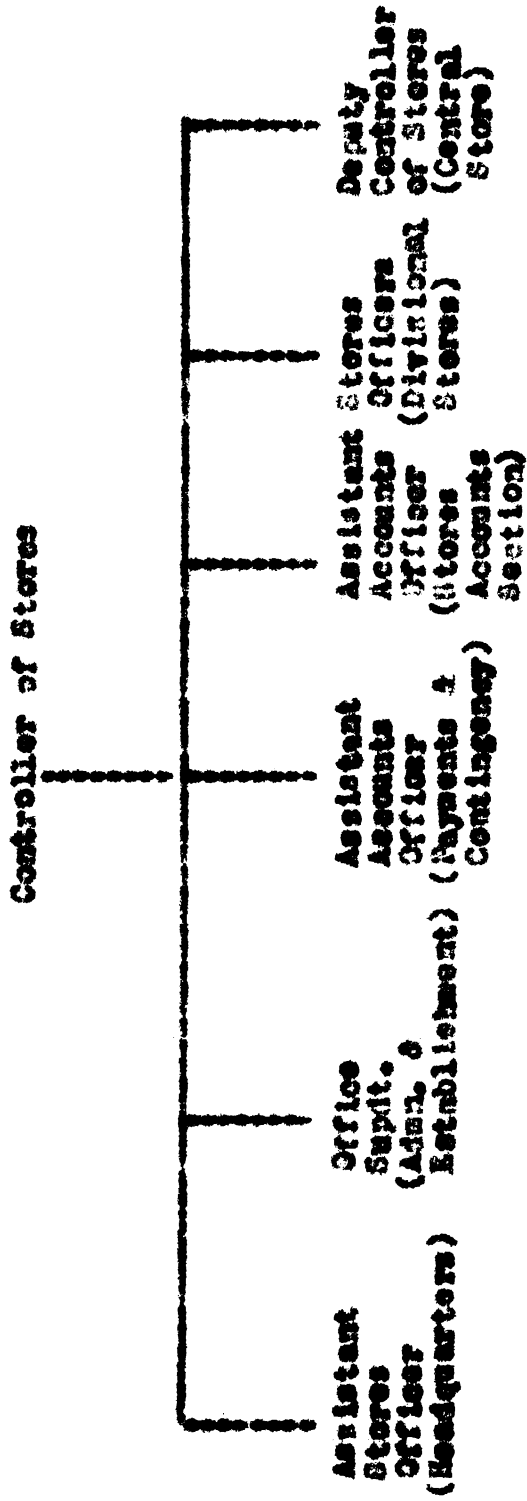
The Controller of Stores at the head office undertakes the centralised planning, coordination and control of stores activities in the Corporation.

Figure 5.20  
PURCHASE ORGANIZATION IN GUJARAT SENG





**Figure 5.20**  
**STORES ORGANIZATION IN GUJARAT SENC**

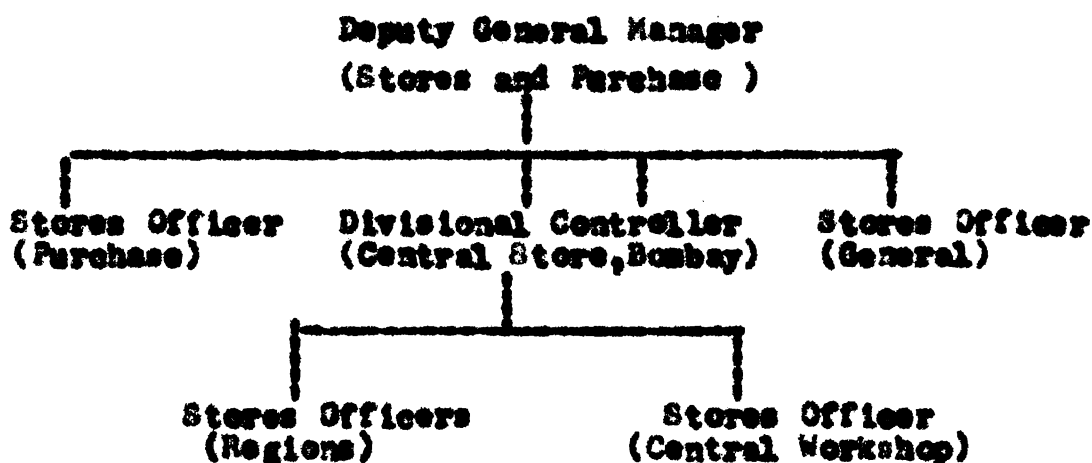


The central store is headed by a Deputy Controller reporting to the Controller of Stores. The requirements of the divisions are consolidated at the central store and forwarded to the purchase department. The stock levels and consumption trends at the divisions are also monitored by the central store. The materials stocked at the central store are essentially meant for supplying to the central workshop. The depots draw their monthly requirements from divisional stores. The divisional stores receive materials against the purchase orders released by the purchase department. The inspection, accounting, issue and disposal of scrap items are carried out at divisional stores as per the procedures laid down.

#### **IV. Maharashtra SRTC**

The materials management department in M&SRTC is headed by a Deputy General Manager ( Stores & Purchase ), reporting directly to the General Manager. He is assisted by two Stores Officers at the head quarters and one Divisional Controller at the central store. The materials management organisation is given in Figure 5.22.

**Figure 5.22**  
**MATERIALS MANAGEMENT ORGANIZATION**  
**IN MAHARASHTRA SRTC**



The purchase of A and B items is made from the central office, whereas the purchase of C class items required by the divisions is undertaken by the stores officers in the respective regions. In case of emergencies when vehicles would otherwise be off-road, materials are purchased locally by the stores officers at the divisions or depot managers following certain procedure.

The stores set up follows a three tier structure with one central store, 25 divisional stores and 166 depot stores. Besides, there are three central workshop stores which also get supplies from the central store. The central store stocks A and B categories of auto-stores and certain items of

general stores which are supplied to the divisional and central workshop stores against Stock Review Statements for auto-stores and Monthly Bulk Indents for general stores. So far as C category items are concerned the stores officer at the Regional Office takes care of the supply through rate contracts. The depot stores obtain replacement of stocks from the divisional stores. The regional office constantly reviews the stock levels in divisional stores and depot stores in order to avoid stockouts and over-stocking of materials.

The Tender and Stores Committee of the Corporation decides on the sources, rates and quality of materials to be purchased. The Divisional Controller ( Central Store ) operates the rate contracts for A and B items and looks after the requirements of the divisions.

#### General analysis of materials management set up in STUs

Some of the significant features of the materials management set up in ISRTC and in other selected undertakings may be summarised as follows.

Sl No	Undertaking & fleet strength (1981)	Head of materials function	Purchase set up	Stores set up
1	Kerala SHIC (3293)	Controller of Purchase & Stores reporting to the General Manager	Centralised at the head office, except for local purchases by depots in emergency situations	One Central Store, one Regional store and 43 sub-stores attached to the operating units & work-shops. Follows two tier structure in southern and three tier structure in northern regions
2	Karnataka SHIC (5423)	Controller of Stores & Purchase reporting to the General Manager	Centralised at the head office, except for local purchases at lower levels	Three tier structure with one central store, 12 divisional stores, 2 regional workshop stores and 65 depot stores. Central store stocks only critical items & imported materials
3	Andhra Pradesh SHIC (7839)	Chief Controller of Stores reporting to the General Manager	Purchasing undertaken at head office and regional levels and only local purchases at depots	Two tier structure with 5 regional stores and 107 depot stores. There is no central store

Sl. No.	Undertaking A fleet strength ( 1981 )	Head of materials function	Purchase set up	Stores set up
4	Gujarat SRTC (69%)	Purchase and stores functions are separated and placed under two officers - Controller of Purchase and Controller of Stores both report to the Deputy General Manager(Gen)	Purchasing is mostly centralised at the head office, except for local purchases at depots, divisions and central workshops	Although there is a central store it supplies materials to the central workshop only. Divisions receive materials directly from suppliers and replenishes stock of depots. Hence a two-tier set up.
5	Maharashtra SRTC ( 10,360 )	Deputy General Manager (Stores and Purchase) reporting directly to the General Manager	Purchase of 'A' & 'B' items made by Central Office and 'C' items purchased by Regional Office. In emergency situations local purchases are made by depots/divisions	Three tier set up with one central store, 24 divisional stores, 3 workshop stores and 16% depot stores. Central store stocks A & B classes of auto stores & certain general stores only.
6	Madhya Pradesh SRTC ( 2-595 )	Chief Stores and Purchase Officer reporting to General Manager	Purchase of A and B items made by head office, C group items and general stores purchased at divisional level and local purchases at depot level.	Three tier structure with one central store, 5 divisional stores, one central workshop store and 6% depot/subdepot stores.

Undertaking Sl. & fleet No. strength (1981)	Head of materials function	Purchase set up	Stores set up
7 Rajasthan SKFC (2400)	Chief Controller of Stores reporting to the General Manager	Purchasing is mostly centralised at the headquarters, except for local purchases at lower levels	Three tier structure with one central store, 8 divisional stores, 2 central workshop stores and 33 depot stores
8 Pandiyan Roadways company (1078)	Stores and purchase department is headed by Assistant Manager (Purchase) reporting to General Manager	Purchasing is centralised at head office	Two tier structure with one central store, 2 workshop stores and 13 branch stores.
9 Choran Transport Company ( 1038 )	Deputy Manager (Materials) is the head of the depart- ment. He reports to General Manager.	Purchasing is centralised at head offices.	Two tier structure with one central store, one workshop store and 23 branch stores.
10 Cholan Roadways Company (805)	Purchase and Stores functions are sepa- rated. Purchase dept. is headed by Assis- tant Manager(Purchase) and Stores dept. is headed after by Dy. General Manager(Stores). Both report to General Manager (Engineering)	Purchasing is centralised at head office	Two tier structure with one central store, one central workshop store and 17 branch stores.

Sl. No. of Undertaking a fleet strength (1981)	Head of materials function	Purchase set up	Stores set up
11 Ahmedabad Municipal Transport (624)	Controller of Stores heads the stores and purchase department. He reports to the General Manager.	Purchasing is centralised at the head office	Two tier structure with one central store, one central workshop store and one depot store.
12 Anna Transport Company (540)	Stores and purchase department headed by Deputy Manager(S&P). Reports to General Manager.	Purchasing is centralised at head office	Two tier set up with one central store, one central workshop store and 9 branch stores.
13 Palleavan Transport Company (District) (539)	Materials Manager, reporting to the Managing Director.	Purchasing is centralised at head office.	Two tier set up with one central store, one regional workshop store and 7 branch stores.
14 Poona Municipal Transport (386)	Purchase and Stores Department headed by Controller of Stores, reporting to the General Manager.	Purchasing is centralised at head office	Two tier structure with one central store, one workshop store and 2 depot stores



Undertaking Sl. and fleet No. strength (1961)	Head of materials function	Purchase set up	Stores set up
15 Thanthal Periyar Transport Company (351)	Stores and Purchase department headed by Officer-in-Charge of stores. He reports to General Manager	Purchases are handled by central office	Two tier set up, with one central store, one central workshop store and 13 branch stores.
16 Orissa Road Transport Company (315)	Works Engineer (Stores) heads stores & purchase department. He reports to General Manager	Purchases made by a departmental committee at head office	Two tier set up with one central store, one central workshop store and 12 substores
17 Kagalend State Transport (143)	Purchase and stores functions are sepa- rated. Purchase function is handled by General Manager. Stores functions are looked after by a Stores Officer reporting to the Auto- mobile Section.	Purchasing is centralised at head office	Two tier structure with one central store, one central workshop store and 8 depot stores.

Sl. No.	Undertaking and fleet strength (1981)	Head of materials function	Purchase set up	Stores set up
18	Meghalaya SIC (96)	Purchase and stores functions are separated. Purchase is handled by the General Manager. Stores is looked after by a Stores Officer reporting to the Chief Automobile Engineer	Purchasing is centralised at head office	Two tier structure with one central store, one central workshop store and 5 depot stores.
19	Kolhapur Municipal Transport (73)	Stores and purchase functions are separated. The stores section is headed by Stores Supdt. and purchase is handled by the Purchase Officer.	Purchasing is centralised at the head office	There is only a single store in the undertaking, which is divided into two sections - major stores and minor stores.

Although there are several differences in the structure and set up of material management function in the state transport undertakings in India, a few general observations can be made on the basis of the above analysis.

(i) Almost all the large undertakings ( with fleet strength of more than 2000 ) have an integrated materials management organisation, with purchasing, stores and other materials functions placed under a single manager. An exception to this is the Gujarat SRTC where the purchase and the stores functions are placed under two separate controllers. In small undertakings, particularly in the newly established undertakings, the purchase and the stores functions are handled by different officers without any integrated set up.

(ii) In undertakings having a single materials head, he often reports directly to the chief executive officer, who in most cases is the General Manager. In undertakings where purchase and store functions are separated, the officers in charge of these functions report to one of the senior managers below the level of the chief executive officer.

(iii) There is no commonly accepted designation for the head of the materials management function in state transport undertakings. Although the title, "Materials Manager" is

found in favour with many large industrial organisations in the country, only one state transport undertaking, the Pallavan Transport Company was found to use this designation for the head of its materials management function. In other undertakings he is variously designated as "Chief Stores and Purchase Officer", "Controller of Stores and Purchase", "Assistant Manager (Purchase)", "Chief Controller of Stores", "Works Engineer (Stores)", etc. Among these the designation "Controller of Purchase and Stores" with some minor changes and modifications in certain cases, is found to be used by several undertakings.

(iv) Every undertaking has its individual managerial attitudes and considerations toward its organisational set up. Hence there are several differences in the structure and reporting relationships of materials management department from one undertaking to the other. In spite of these differences it is possible to see two broad patterns of materials management set up in these undertakings.

(a) Type A : Organisations following this structure have a strong materials management department at the head office, with senior personnel in charge of purchasing, stores and inventory control. Often, there will be a central stores located at or near the head office which is supervised and controlled from head office. Most of the supplies to the substores are routed through central store. Purchasing is

almost always centralised at the head office in these undertakings.

This type of set up is suitable for undertakings operating only city service or in limited areas or for small and medium size undertakings ( upto 1500 vehicles ) operating district services.

This pattern is adopted by almost all the city transport undertakings like BEST, Ahmedabad Municipal Transport, Poona Municipal Transport, etc. Most of the small and medium sized undertakings operating district services are also found to follow this set up. Examples include Cholan Road Ways Company, Nagaland ST, Pandiyan Road Ways Company, Orissa Road Transport Company, Anna Transport Company and Pallavan Transport Company. The Kerala SRTC, Rajasthan SRTC and to a large extent the Karnataka SRTC have also adopted this pattern, although they own a fairly large fleet and operate services at the state level.

(b) Type B : Undertakings having this structure are more decentralised. The materials department at the head office is comparatively weak, with only the head of the department and a few officers to assist him in the supervision and overall coordination of the materials functions. Purchase of the high value and critical items are also

carried out at the head office. Regions and divisions are staffed with senior personnel in purchasing and stores functions. They are given greater authority for decision-making. They purchase all the materials required for the regions/divisions, except the high value and critical items purchased by the head office. Receiving, stocking, accounting and disposal of obsolete materials are also carried out at this level.

This type of structure is generally suitable for large undertakings ( fleet strength above 2000 vehicles) operating on rural and district services.

Three undertakings namely Maharashtra SRTC, Andhra Pradesh SRTC and Madhya Pradesh SRTC follow this kind of structure in their materials department. The set up in Gujarat SRTC is also largely the same except that all the purchase orders are released from head office. The subsequent functions are handled by stores department at the divisional levels.

(v) The set up of stores in most STUs follows a hierarchical structure, with one central regional store supplying materials to several substores spread over a region. Quite often, it is either a three tier structure or a two tier structure, although there are one or two undertakings with a single tier structure.

In a three tier system, the organisation consists of (i) Depot stores (ii) Divisional stores/Workshop stores and (iii) Central stores. This set up is generally followed in the municipal or district transport undertakings. It exists in corporations like Maharashtra SRTC, Uttar Pradesh SRTC, Madhya Pradesh SRTC, Rajasthan SRTC, Assam SRTC, North Bengal SRTC, etc.

Under the two tier system, there are two different patterns of structures. In the first category, the organisation consists of Central Stores and Depot Stores/Workshop Stores only. The Divisional Stores are eliminated. This is followed in city transport undertakings and small district transport undertakings like Pallavan Transport Company, Poona MT, BIST Undertaking, Ahmedabad MTS, Cholan Road Ways Company, Pandiyan Road Ways Company, Meghalaya SRTC, Anna Transport Company, Orissa Road Transport Company, Thanthal Periyar Transport Company, etc.

In the second category of the two tier set up, there are only Divisional/Regional Stores and Depot/Workshop Stores. The Central Store either does not exist or, if it does it stocks certain critical items or materials required for the Central Workshop only. This system is followed in some of the large district transport undertakings like Andhra Pradesh SRTC and Gujarat SRTC. In Karnataka SRTC, although there is a Central Store, it stocks only the

critical items and imported materials. Most of the materials are obtained by the divisional stores directly from the suppliers against centralised purchase orders. Hence, for all practical purposes, this also can be considered as a two tier set up.

In Punjab State Transport, there are only depot stores; there is no central store. In Kolhapur MIS, there is only a single store in the entire undertaking. This pattern of having only central or depot stores can be called single tier set up.

The three tier and two tier set ups are diagrammatically represented in Figures 5.23 and 5.24 respectively.

The stores set up in KERTC, as already explained is a combination of the three tier and two tier set up. It is diagrammatically shown in Figure 5.25.

#### Suggested Materials Management Set up for KERTC

On the basis of the preceding analysis of the materials management set up in other STUs, a new structure is being proposed for KERTC. This new set up may rectify most of



Figure 5.23  
THREE TIER SET UP

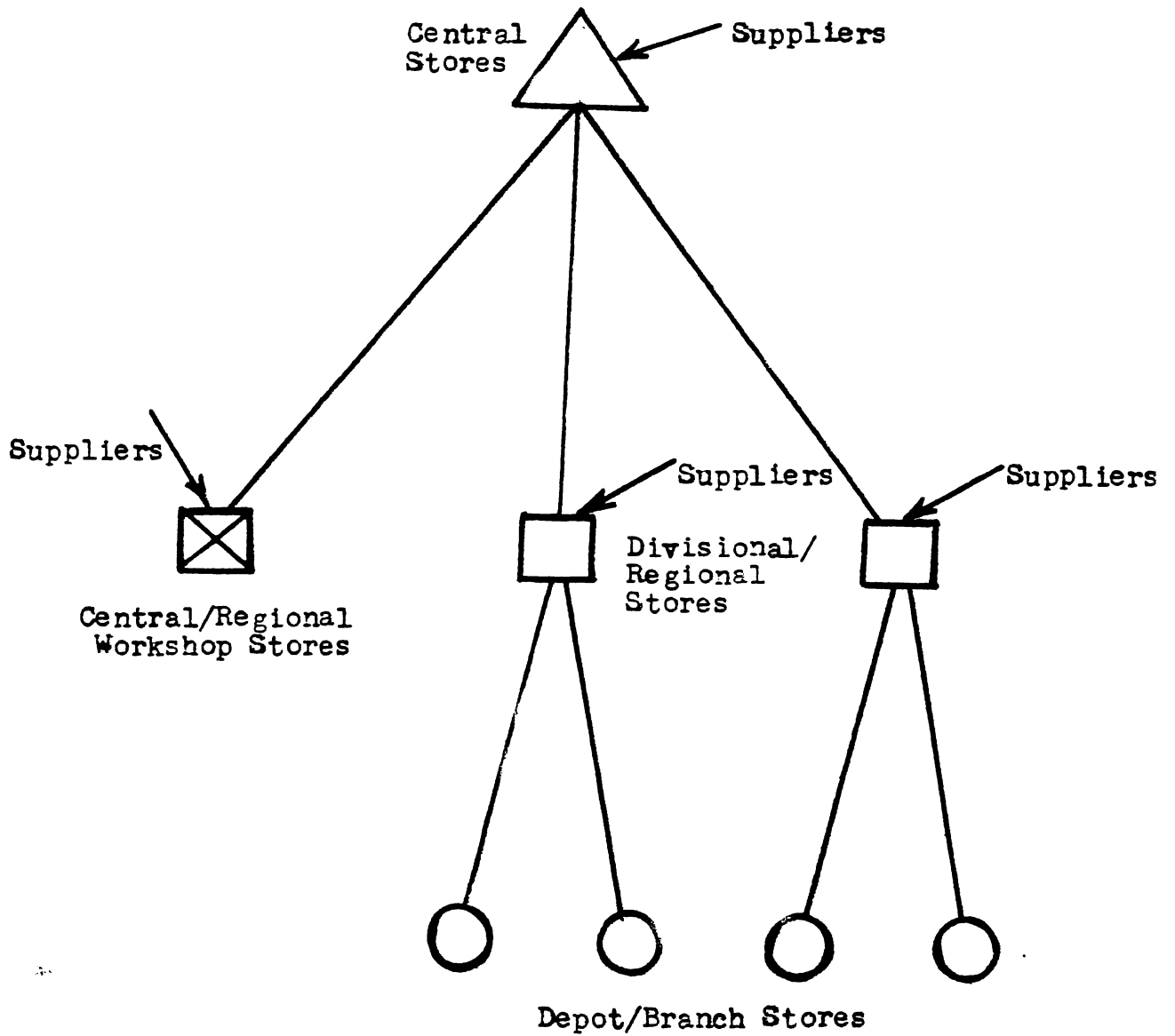
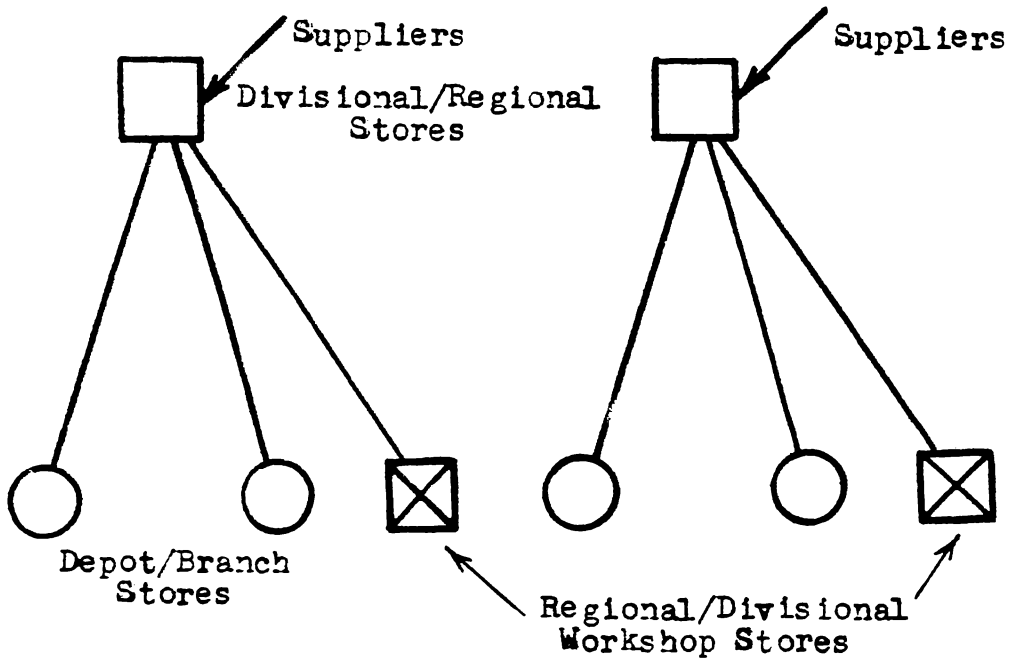


Figure 5.24  
TWO TIER SET UP

Very large undertakings



Small undertakings

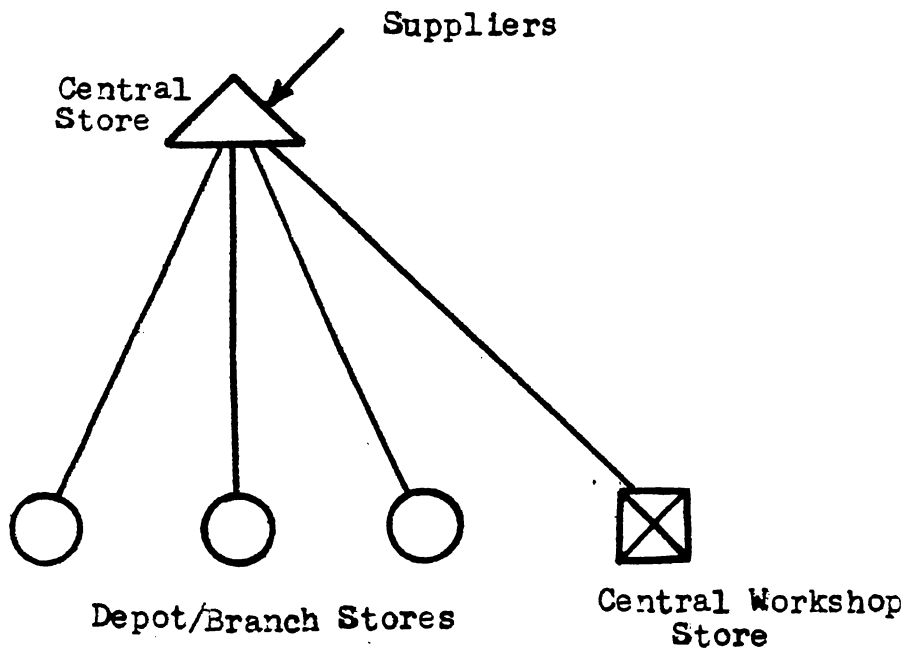
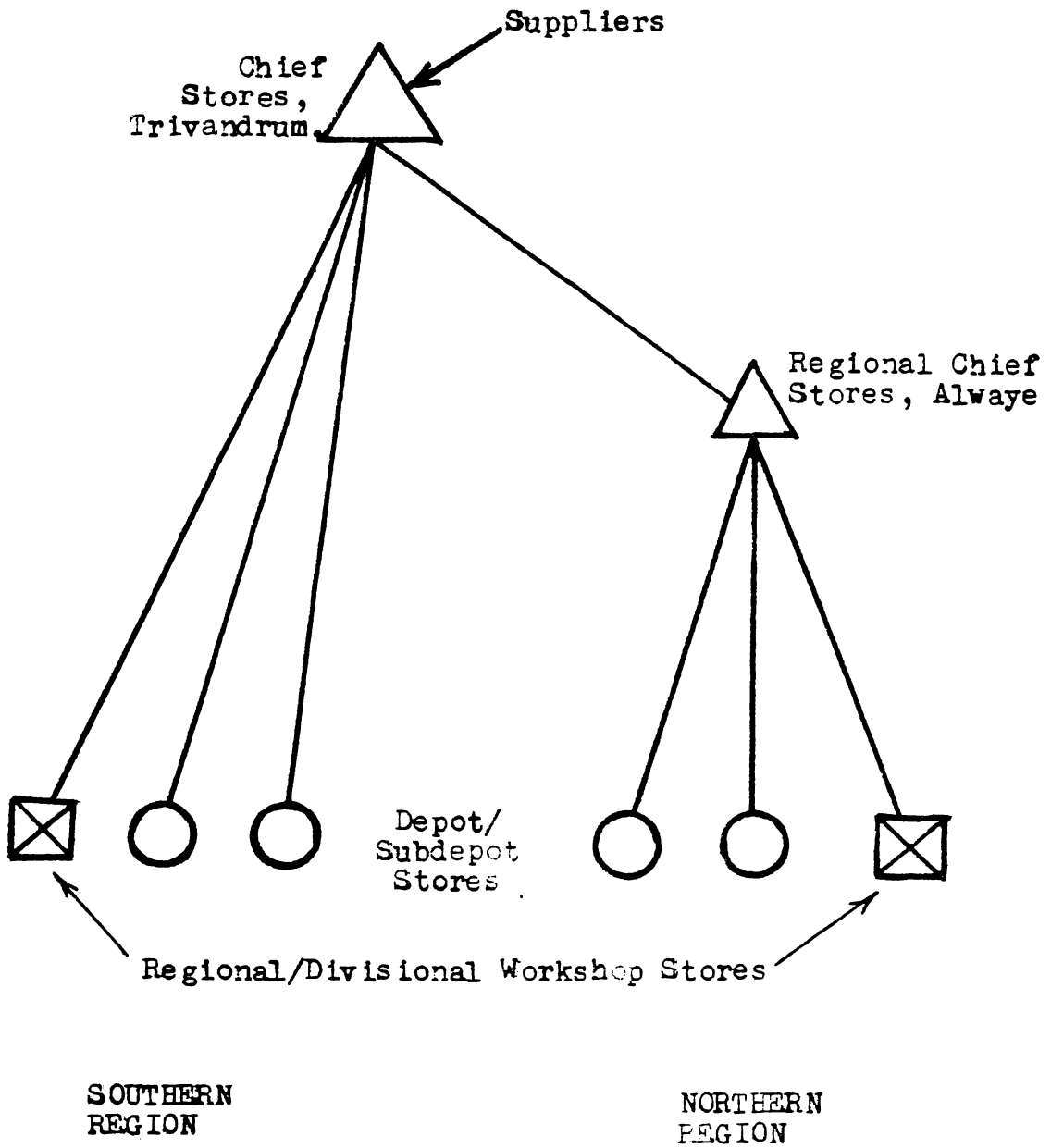


Figure 5.25

STORES SET UP IN KSRTC



the weaknesses of the present structure indicated above.<sup>9</sup>  
 This materials management set up has been integrated  
 with the divisionalised general administrative set up  
 suggested above for the MBRIC as a whole.<sup>10</sup>

(1) The head of the materials management function may be the Controller of Purchase and Stores, reporting directly to the General Manager. The heads of mechanical engineering and traffic functions will also report directly to the General Manager as shown in Figure 5.12, so that coordination among these functions will be facilitated.

(2) The Controller of Purchase and Stores may be assisted by one Assistant Controller (Purchase) and one Assistant Controller ( Materials Management Services ) at the head office. The Stores Officer ( Central Store ) may also report directly to him. The proposed organisation at head office is given in Figure 5.26.

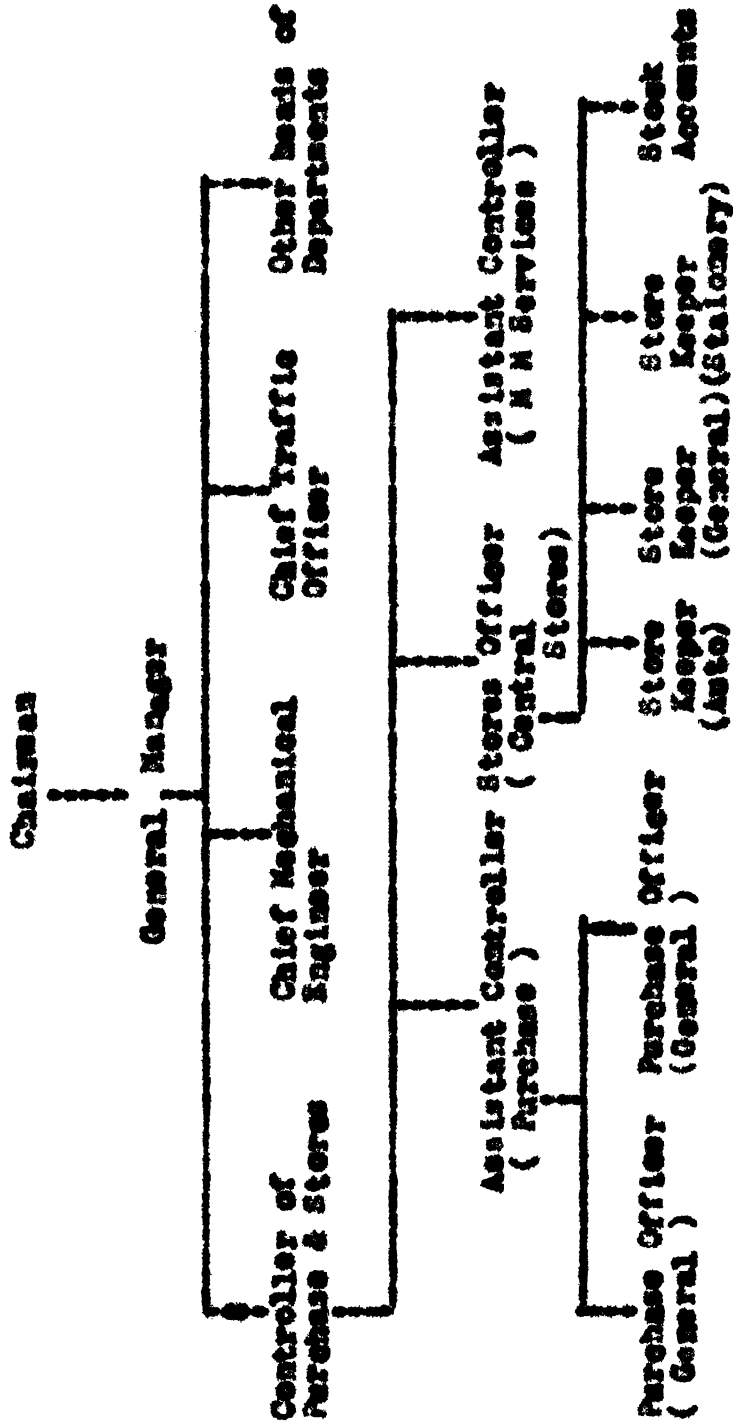
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9 See Chapter V, pp. 189-190.

10 See Figures 5.12 and 5.13.

Figure 5.26

PROPOSED MATERIALS MANAGEMENT ORGANISATION - HEAD OFFICE



(3) The head office may deal with the purchase of A and B category items of all divisions. The items to be categorised as A and B are to be determined on the basis of an ABC analysis of all the items required by the Corporation. The Assistant Controller (Purchase) may pool the requirements of the divisions for these materials based on their indents and may arrange for supply of the materials directly to the divisional stores.

(4) The purchase of C category items required by the divisions may be done by the Assistant Controller (Purchase and Stores ) at the divisions based on the policies and procedures prescribed. The proposed materials management set up at the divisional level is shown in Figure 5.27.

(5) The Central Store at the head quarters may stock imported materials, critical items and other selected items with high unit cost and low demand. These materials will be supplied to the divisions on the basis of monthly indents and also in emergency cases. The regular supplies will be made directly to the divisional stores from the vendors.

(6) The depot/sub depot stores and regional/divisional workshops will obtain supplies from the divisional stores on a monthly indent basis and also on vehicle off-road indent in emergency cases. The new set up of stores is shown in Figure 5.28.

**Figure 3.27**  
**PROPOSED MATERIALS MANAGEMENT ORGANIZATION - DIVISIONAL LEVEL**

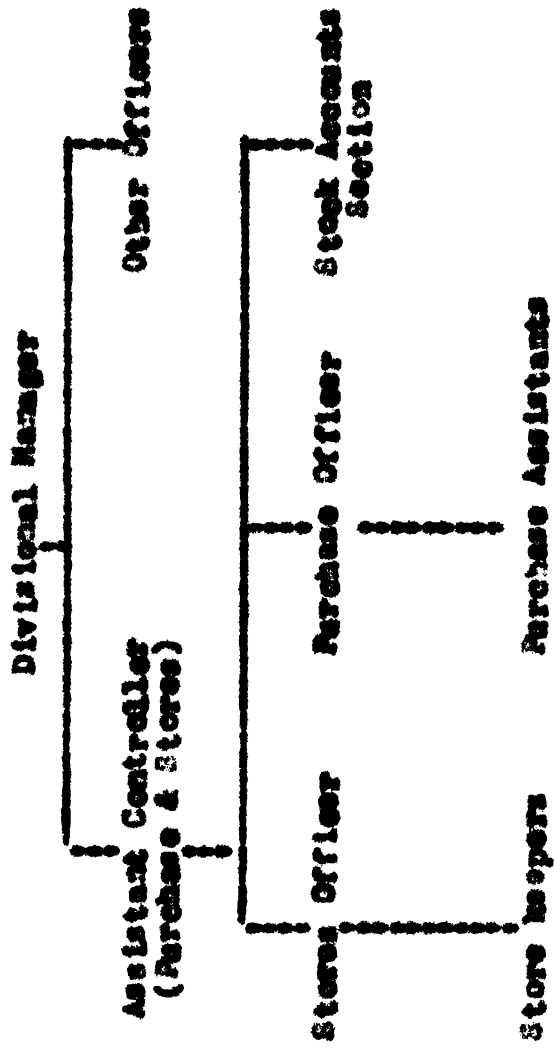
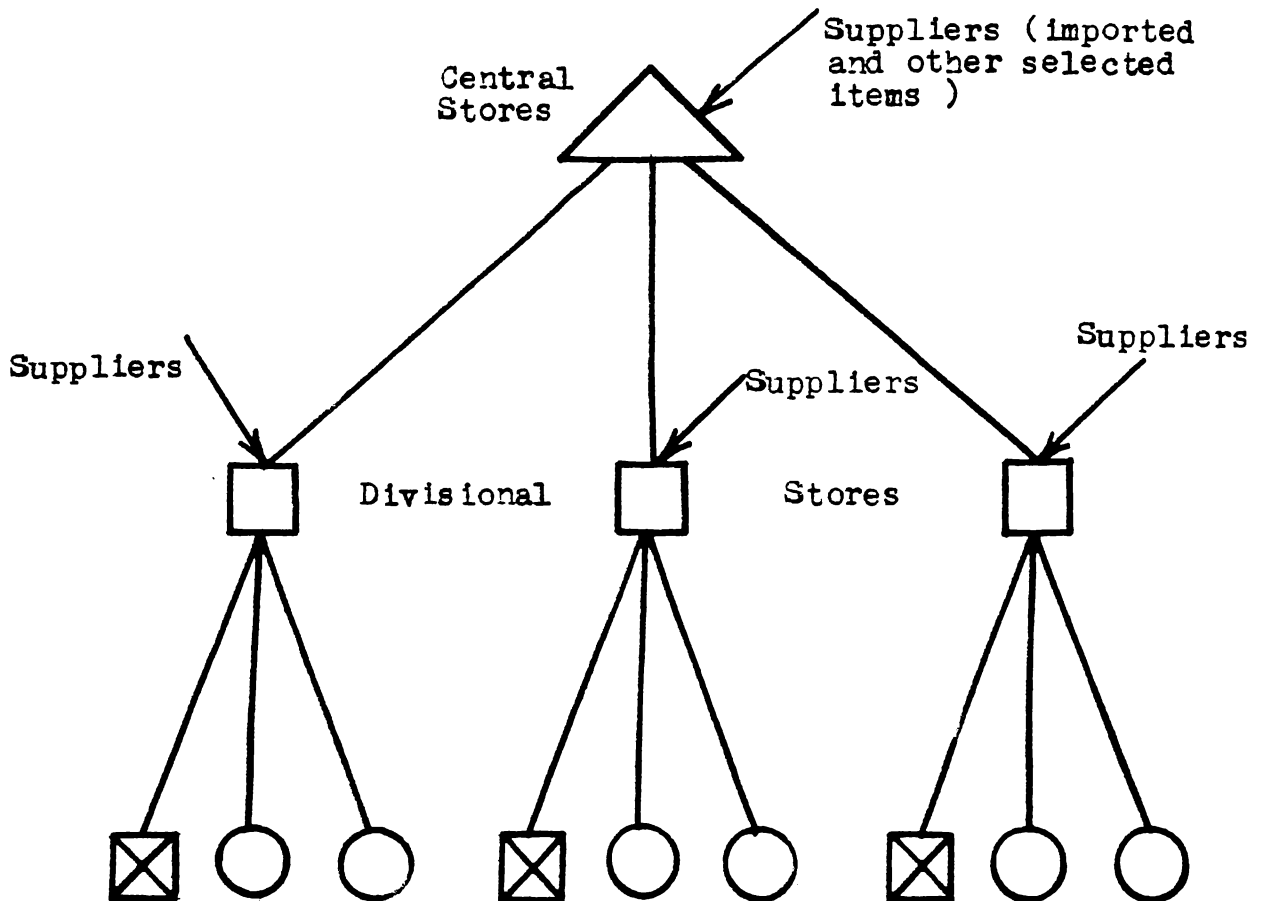


Figure 5.28  
PROPOSED STORES SET UP IN KSRTC



- Regional/divisional workshop stores



- Depot/subdepot stores

Note

1. The central store will receive, stock and supply to the divisional stores, the imported items, critical items and other selected items of high unit cost and low demand only. It will also stock and supply items of general stores to the head office.
2. The regular requirements of all other materials of the divisions including the workshops will be supplied by the vendors directly to the divisional stores.

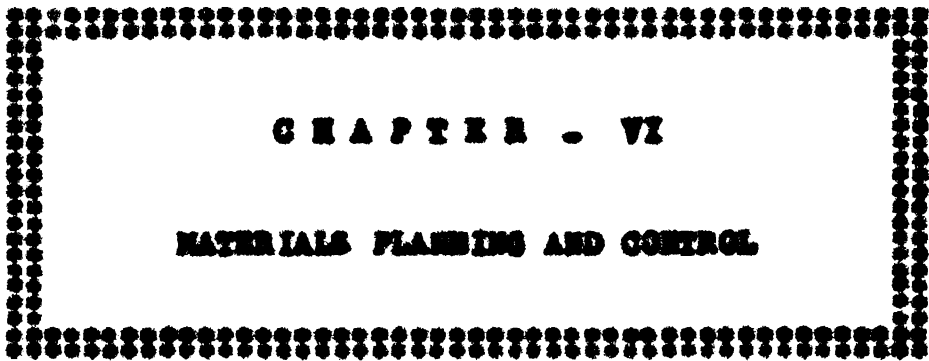


(7) The Assistant Controller ( materials management services ) will be in a staff position to the Controller of Purchases and Stores. He will be responsible for undertaking value analysis studies; codification, standardisation and simplification of items; devising efficient inventory control systems for the stores and for suggesting effective methods of cost reduction in materials. He will undertake studies on specific areas or problems as suggested by the Controller for the achievement of materials management objectives in MSRIC.

The new materials management set up as suggested above may be able to rectify most of the weaknesses of the existing structure. With the Controller of Purchase and Stores, Chief Traffic officer and Chief Mechanical Engineer reporting directly to the General Manager, coordination among these closely related functions will be easy. The divisional set up under which Assistant Controllers ( stores and purchase ) would be vested with greater authority for decision making should enable the execution, coordination and control of the materials functions more effectively. Since most of the supplies for the divisional stores would be obtained directly from the vendors,

some of the unnecessary and costly movements of the materials can be avoided. With the divisional stores located not far away from the depot stores, the overall inventory levels in depot and divisional stores can be reduced without affecting the service levels. The Assistant Controller ( Materials Management Services ) provided in the new set up would enable the Corporation to devise and implement effective and efficient methods of purchasing, stocking and control of materials, thereby improving the performance of materials management function.

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**CHAPTER - VI**

**MATERIALS PLANNING AND CONTROL**

Forecasting the material requirements is one of the primary prerequisites for carrying out materials management function. Judicious planning facilitates efficient and economic purchasing, stocking and control of materials, resulting in lower material costs, thus contributing to the greater profitability of the enterprise. It enables the management to anticipate and to prepare for meeting future material needs, capital requirements for material purchases and the several external and uncontrollable factors that are likely to influence the availability and supply of materials.

Materials planning is the scientific method of determining the quantities and time schedule of requirements of raw materials, components, spare parts and other items for meeting production/operation needs. Materials planning is a part of overall planning activity in an enterprise. It follows certain major steps.

#### 1. Crystallise the problem

The first of such steps would be to visualise the materials planning problem clearly and completely. This requires analysis of the present condition that requires improvement and a clear understanding of the organisational plans, objectives and policies as relevant to the materials management function.

## **2. Establish planning premises**

The second major step in this direction is to establish the planning premises. The planning premises will joint out the expected environment or the background assumed to exist during the plan period. These are forecast data of a factual nature, relevant basic policies and existing company plans, particularly the production plan. Forecasts of material prices, material availability and supply conditions, changes in import policies, taxation, price control, inventory norms, etc. are of critical importance for materials planning.

The following questions are helpful in this context.<sup>1</sup>

- (a) What important assumptions regarding the future are being made in order to evolve the plan ?
- (b) Do the assumptions cover all important contingencies ?
- (c) Has all reasonably available information concerning the planning assumptions been obtained and evaluated ?
- (d) What assumptions must be carefully watched in order to detect changes which might bring about a serious effect upon any plan based upon these assumptions ?

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<sup>1</sup> George R. Terry, Principles of Management, Homewood, Illinois, Richard D. Irwin, 1964, p. 227.

3. The third step would be to estimate material requirements and prepare the materials plan.

Knowledge of the different types of materials required and their timing and quantities of requirement are essential for any planning exercise. Material requirements can be forecast from past consumption or by relating bill of materials or established norms of consumption to the estimated demand of end products/services.

A materials plan shows the quantity of different materials required and the time schedule of their requirements, usually the monthwise requirement. This is prepared from the forecast of material requirements after suitably adjusting it for the uncontrollable factors indicated above.

#### **Materials Planning Techniques**

It follows from the preceding discussion that the essence of materials planning lies in determining (a) the quantities and (b) the time schedule of material requirements during a specified period. Several methods ranging from 'rules of thumb' and subjective judgements to more refined forecasting techniques like exponential smoothing and computerised techniques like Material Requirements Planning (MRP) systems are available for determining the material

requirements. The choice of a technique for a specific situation depends on several factors like the nature of materials planning problem, the organisation and its people, the availability of data, and the characteristics of the technique itself. Hence it is necessary to understand the essential features of these techniques before discussing their applicability for materials planning in State transport undertakings. A few of such techniques are examined below.

#### **(1) Bill of Materials**

A bill of material, in its simplest form, is a parts list - a listing of each component required to make a product or a unit of a product. Component number, description, quantity required per assembly and the source - whether manufactured or purchased, are usually indicated in most bill of materials.

Once the master schedule/production plan is finalised, each product is exploded into its basic requirements with the help of its bill of materials. The number/quantity of components or materials required for each product is multiplied by the number to be produced in order to arrive at the total requirement. Allowances for rejections and losses at various stages should be given. The aggregate requirements are obtained by combining the itemwise requirements of all the end products.

The bill of materials technique is ideally suitable for fabricated or assembled products which are, in turn, made up of subassemblies and parts.

#### (ii) Forecasting techniques

There are several items like maintenance spares for which bill of materials or norms of consumption cannot be worked out. The future requirements of these materials can be forecast using the past consumption data.

There are many different forecasting methods in use.<sup>2</sup> The appropriate one for a particular situation depends upon the nature of the forecasting problem, the skills available, the information system in use and the philosophy of management. Of the several forecasting techniques available the moving average and exponential smoothing methods are reported to have become increasingly popular in production and inventory control applications during the recent years.<sup>3</sup> These two methods will be briefly explained.

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- 2 For a detailed discussion on the different forecasting methods, see (i) Steven C. Wheelwright and S. Makridakis, Forecasting Methods for Management, New York, John Wiley & Sons, 1977 (ii) H.G. Brown, Smoothing, Forecasting and Prediction, Englewood Cliffs, New Jersey, Prentice-Hall, 1963 and (iii) Spyros Makridakis and Steven C. Wheelwright, "Forecasting: Issues and Challenges for Marketing Management", Journal of Marketing ( Chicago ), October 1977, pp.24-36.
- 3 Joseph G. Monks, Operations Management: Theory and Problems, Tokyo, McGraw Hill Kogakusha, 1977, p.275.



### **(a) Simple Moving Average Method**

A simple moving average is obtained by summing and averaging the values from a given number of periods repetitively, each time deleting the oldest value and adding a new value. For a stationary series with no significant trend, a long term moving average, say, 12, 15 or even 18 month moving average, would give good results. On the other hand, if sharp changes in demand level are to be expected, short term moving averages will detect these changes better. It has the additional advantage that it can be applied to any data, whether they fit a precise mathematical curve or not.

Although very simple to calculate, the moving average has four main disadvantages. These are as follows.

- i. It is necessary to store demand data for the previous  $n-1$  time periods in order to calculate a fresh forecast.
- ii. Moving averages can be strongly affected by extreme values.
- iii. It cannot easily take care of seasonal variations, especially of short durations.
- iv. When beginning the calculation of a moving average from demand data no true forecast can be made until at least  $n$  periods have passed. This can be overcome to a certain extent by using an 'initialised moving average'.

An initialised moving average is calculated dividing the sum of the data so far available by the number of periods from which that data is drawn until  $n-1$  periods have passed. Then from the  $n^{\text{th}}$  period onwards, the true moving average can be calculated.

#### (b) Exponential Smoothing Method

Exponential smoothing is a type of moving average forecasting technique which weights past data in an exponential manner so that the most recent data carries more weight in the moving average.<sup>4</sup> By contrast, in a simple average, data in the previous  $n$  periods are weighted equally by  $1/n$  and data older than this are ignored, i.e. given zero weighting. Simple exponential smoothing makes no explicit adjustment for trend effects whereas adjusted exponential smoothing does take trend effects into account. The use of exponential smoothing in inventory forecasting was introduced by Brown.<sup>5</sup>

With simple exponential smoothing, the forecast is made up of the last period forecast plus a portion of the difference between the last period actual demand and the last period forecast.

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<sup>4</sup> Joseph G. Monks, *Op. cit.* p.293.

<sup>5</sup> R.G. Brown, Statistical Forecasting for Inventory Control, New York, McGraw Hill, 1959, p.13.

This can be expressed as follows.

$$F_t = F_{t-1} + K ( D_{t-1} - F_{t-1} )$$

where  $F_t$  = current period forecast

$F_{t-1}$  = last period forecast

$K$  = smoothing constant

$D_{t-1}$  = last period demand

It can be observed from the above equation that each forecast is simply the previous forecast plus some correction for demand in the last period. If demand was above the last period forecast the correction will be positive, and, if below, it will be negative. The smoothing constant  $K$  actually dictates how much correction will be made. It is a number between zero and one used to compute the forecast. When  $K$  is low, more weight is given to past data, and when it is high, more weight is given to recent data.

The necessary information to set up an exponential smoothing forecasting system includes the following.

- (i) Some initial estimate of the level ( usually an average of historical data )
- (ii) A value for the smoothing constant  $K$ .

A satisfactory value of  $K$  can generally be determined by trial-and-error testing of different smoothing constants

to find one that has a good fit with past data. The correct K value should facilitate forecasting by providing a reasonable reaction to demand without incorporating too much erratic fluctuation. An approximate value of K equivalent to an arithmetic moving average, in terms of the degree of smoothing, can be estimated from the following relationship.

$$K = \frac{2}{n + 1} \quad \text{where } n \text{ equals the number of periods in the moving average.}$$

Thus a seven-year moving average would correspond, roughly, to a K value of 0.25.

The exponential smoothing method of forecasting is found superior to that of moving averages, for the following reasons.

- (1) Only one piece of information need be retained between forecasts. Hence data processing becomes more economical.
- (2) Only one initial estimate is required as opposed to  $n-1$  in moving average method.
- (3) The sensitivity of the exponential smoothing forecast can be easily altered by changing the value of the smoothing constant, K.

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6 G.W. Flossl and O.W. Wight, Production and Inventory Control, New Delhi, Prentice Hall, 1979, p.38.

(4) Past data are rejected gradually rather than suddenly.

The simple exponential smoothing method, as explained above, can be suitably adjusted for trends and seasonality. It enables the exponential smoothing method to be employed in a wide variety of routine forecasting situations.

### (iii) Network Techniques

(a) Programme Evaluation and Review Technique ( PERT )/  
Critical Path Method ( CPM )

The bill of materials and the forecasting techniques help to determine the quantity requirements of materials. But the network techniques are primarily useful in assessing the time schedules of materials requirements. Materials planning and purchasing activities can be greatly aided by the use of PERT/CPM techniques. These techniques are now being increasingly used in subcontracting, development work, construction contracts and project buying.

A clear understanding of the sequence, timing and interrelationships among the different activities in the network enables the materials manager to plan for and purchase the materials at the right time. <sup>7</sup> PERT/CPM techniques provide a means of keeping account of critical parts and materials whose delay would hinder production

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<sup>7</sup> For details see P.V. Mathew, "Network Analysis (PERT/CPM): Cooperative Perspective ( Poona ), Vol. 16, No. 2, July - September, 1981, pp. 9-13.

schedules. When PERT/CPM techniques are used in materials planning, the most economical purchasing and traffic decisions can be made. Knowing how much latitude is available on delivery date, purchasing can select low cost suppliers who may require relatively long lead times. It is also valuable in expediting, because it indicates quickly when a crucial delivery deadline is missed.

(b) Line of Balance (LOB)

Line of Balance is another useful managerial tool for time-phasing material requirements and scheduling purchasing and production activities. It is essentially a charting and computational technique whereby the progress of component and subassembly parts is monitored and compared to delivery date requirements by charting the lead times ahead of final assembly. It is a means of integrating the flow of materials and components into the manufacture of items in accordance with phased delivery requirements.

A line of Balance study consists of four principal operations.<sup>8</sup>

- (1) The objective ( delivery schedule ) is ascertained.
- (2) A plan of operation is developed. The plan shows diagrammatically all principal and limiting events in the

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<sup>8</sup> For details see Leonard W. Hein, The Quantitative Approach to Managerial Decisions, New Delhi, Prentice Hall, 1974, pp.330-334.

production process, particularly the major purchased parts and subassembled components required to support the delivery schedule.

(3) A progress chart is prepared. The progress chart shows:

(a) The current status of each of the principal and limiting factors shown on the plan of operations.

(b) A Line of Balance showing the level at which each of the principal and limiting factors should be, as on the date of the study, if the delivery schedule is to be met.

(4) The Line of Balance of each of the principal and limiting factors is compared with the current position of those factors. Those factors out of balance are revealed by a glance at the progress chart. Out-of-balance factors are investigated to ascertain the causes and corrective steps are taken.

LOB provides a chart which helps to visualize when materials and capacities must be available in order to meet delivery commitments. Not only does it highlight the shortages but also the excess availability of parts. Hence this is a very useful aid in materials planning, purchasing and inventory control.

#### **(iv) Material Requirements Planning ( MRP ) Systems**

Material Requirements Planning ( MRP ) technique was developed during the 1960s for determining the material requirements and time-phasing inventory orders in manufacturing organisations. While the bill of materials technique determines the quantity of components and materials required for the manufactured product and the network techniques indicate the timing of their requirement, MRP incorporates both these aspects in a single system.

The MRP technique is designed for use in certain specialised operating situations. The system can be used most advantageously under the following conditions.

1. The principal criterion of MRP applicability, according to Joseph Orlicky<sup>9</sup> is the existence of a Master production schedule to which raw material procurement, fabrication, and subassembly activities are geared. MRP is, therefore, applicable to manufacturing environments that are oriented towards fabrication of components and subassemblies required for the final product.

2. The MRP technique is particularly applicable when usage ( demand ) of the material is discontinuous or highly

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<sup>9</sup> Joseph Orlicky, Material Requirements Planning, New York, Mc.Graw Hill, 1975, p.42.



unstable during a firm's normal operating cycle. This situation is typical by an intermittent manufacturing or job-shop operation.

3. MRP is primarily employed as a component fabrication planning system, in which the demand for all parts ( materials ) is dependent on the production schedule for the parent product. Most production inventory items meet this "dependent demand" requirement. MRP system cannot be applied to items like spareparts whose demand is derived independently ( and cannot be calculated ) from the master production schedule.

4. Another condition required for its application is that purchasing department and its suppliers, as well as the firm's own manufacturing units must possess the flexibility to handle order placements or delivery releases on a weekly basis.

In practice, the MRP approach calculates production material requirements on a weekly basis, based on production schedules that are updated weekly. The master schedule typically specifies the individual end-products and the time periods in which they are to be manufactured. Once the master schedule has been finalised, schedules for the quantities of component materials are calculated from the bill

of materials arrive when needed. In essence, the MRP approach attempts to eliminate ( minimize ) most inventory requirements and gear purchasing and production activities to the timing and quantity usage demands of the final product assembly schedule.<sup>10</sup>

The features of MRP systems have come about largely because of the availability of computers. Without computers, it would be difficult to keep up-to-date records of the status of thousands of items in inventory that are normally found in many intermittent manufacturing situations.

### Materials Planning in Industrial Organisations

Raw materials, components and other items which are directly consumed in the manufacturing process constitute the major share of material requirements in industrial organisations. Requirements of these materials can be determined on the basis of the production programme of end products. Thus, the activities of sales forecasting the end products, production planning and materials planning become intimately connected in industrial organisations. Most of the materials planning techniques explained above such as bill of materials,

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<sup>10</sup> Lesar Lee, Jr. and Donald W. Dobler, Purchasing and Materials Management, New Delhi, Tata McGraw-Hill, 1977, p.198.

forecasting methods, network techniques and MRP are found to be generally applicable and quite useful in such situations.

However, the complexity and problems of materials planning vary depending on the type of manufacturing system - whether a continuous system or an intermittent system. In continuous systems ( e.g. process industries, assembly line manufacture, etc. ) where a relatively small number of standardised products are manufactured in large volume on a regular basis, it is fairly easy to determine the material requirements. The daily requirements of raw materials and chemicals in a fertiliser plant or the components and parts in a scooter assembly plant can be easily established based on the norms of consumption and/or the bill of materials. Since the products are highly standardised and changes in their design and specifications are very rare, materials planning in these industries becomes a simple routine job.

The problem of converting the production plan into the material plan is more complex in intermittent type of manufacturing ( e.g. jobshops ) where a wide variety of products, each in relatively small quantities are manufactured. Here also the production plan forms the basis for estimating the material requirements. The techniques of bill of materials, network techniques and Materials Requirements Planning

systems are most useful in intermittent type situations for estimating and time phasing rawmaterials and parts requirements. However, the requirements of spareparts, lubricants and other similar materials, although forming only a minor share of the total requirement, cannot be directly related to the production programme. Hence, planning for these materials poses several problems. These problems are more acute in road transport undertakings. These special problems are discussed below.

#### Materials Planning in State Transport Undertakings

The nature of the materials planning problem in state transport undertakings is different from that of the industrial organisations. In industrial organisations, materials are primarily required in the manufacturing process, wherein rawmaterials and components are converted into some tangible products. Hence their requirement can be estimated on the basis of the production schedules. But since road transport undertakings provide a service - transportation of people from one place to another, materials are not directly consumed in this transformation process. Bulk of the materials required are for the operation and maintenance of the vehicles used for providing the service.

Building of new bus bodies and the major reconditioning and repairing of the old buses are also undertaken in the workshops attached to the several STUs. These are besides the regular maintenance operations. Materials required for these jobs can be estimated from the schedule of body building and reconditioning programmes using the bill of materials method, as in industrial organisations. Network techniques and MRP systems can be used with great advantage in body building and major production/fabrication works. They can help to improve the planning and scheduling of procurement and execution of such jobs.

The bulk of the requirements of materials in state transport undertakings can be categorised into :

- (i) Materials required for the production programme in workshops and
- (ii) Materials required for the operation and maintenance of the vehicles.

#### Materials required for the production programme

The production programme in the workshops generally consists of the following :

1. Building of new bus bodies
2. Reconditioning of old bus bodies
3. Reconditioning of assemblies

4. Retreading of tyres, and
5. Fabrication of other items.

The volume of each of the above activities can be estimated on quarterly or half yearly basis using the past data and the anticipated production programmes during the period. Bills of materials are prepared by the workshops for bus body building and for tyre retreading works. Similarly, estimates for the materials needed for reconditioning of bus bodies and assemblies are also made by the workshops. The requirements of different materials are then determined by applying the bills of materials and norms of consumption to the estimated production activities.

#### Materials required for the operation and maintenance of vehicles.

There are several materials included in this category such as spareparts, tyres, oils and lubricants, batteries, fuel, etc. Each one of these materials requires consideration of several factors in order to arrive at a reasonably accurate estimate of its requirement. The following factors are usually taken into account while estimating the requirements in road transport undertakings.

1. Past consumption data.

2. Norms of consumption evolved, if any, based on the previous experience.
3. Existing fleet strength and proposed augmentation during the planning period.
4. Age composition of the fleet.
5. Planned changes and expansion in vehicle schedules.
6. Proposed scrapping of old vehicles, their make and model.
7. Estimated lead time and availability of material in the market.
8. Service level or degree of assurance expected to be provided.
9. Availability of finance.
10. In the case of assemblies, the present life and life expected.
11. In the case of tyres, the total life of a tyre ( new and retreaded phases ) and number of retreads per size, plyrating, etc.
12. In the case of fuel, expected average kilometres per litre and total kilometres to be operated.

## Materials planning practices in selected STUs

### 1. Karnataka SHIC

Based on the different schedules of indents, the annual requirements of auto spares and general stores are receiving from the divisions and workshop stores. The indents are consolidated and reviewed at the central office, taking into account the fleet strength at divisions and the production target and actual performance at the workshops.

### 2. Andhra Pradesh SHIC

The demand forecasting for materials is done by the Works Managers for the workshops and the Mechanical Engineers for the divisions. The estimates are based on past consumption, fleet strength, augmentation and production pattern in workshops. These lists are scrutinised and modified, wherever necessary by the Joint General Manager (Mech.Engg) for 'A' and 'B' class items and by the heads of mechanical engineering sections in the respective Areas for 'C' class items. These are then sent to the Purchase Department for procurement action.

### 3. Gujarat SHIC

The divisions raise 'annual bulk indents' based on average past consumption and the anticipated production



programmes. This is initiated about 9 - 10 months in advance, according to the prescribed calendar of indents. These indents are consolidated at the Central Stores and the Purchase Department is intimated for procurement action.

#### 4. Maharashtra SRTC

Materials requirements in central workshops are estimated on the basis of production programme for (i) building new bus bodies, (ii) retreading tyres and (iii) reconditioning of assemblies and old bus bodies. For this purpose the workshops furnish "Production Material Forecast and Provisioning Statement" every 3 months. This statement shows the record of consumption during the preceding 3 months and during the same 3 months in the previous year and a future forecast of requirements for a total of 27 'ten-day' periods. The requirements of spareparts and other materials used by the divisions and depots are estimated on the basis of average consumption data during the previous year.

#### 5. Madhya Pradesh SRTC

This undertaking has adopted the same format and procedure as in the Maharashtra SRTC which has been described above, for planning the material requirements.

## 6. Rajasthan SRTC

The demand forecasting of spareparts and other materials is done mainly on the basis of past consumption. This is generally revised upwards by 10% of the past consumption figure to reflect possible increases in consumption during the planning period. All the divisions and central workshops intimate their estimates of material requirements for the following financial year by January to the Inventory Control Section of central stores. It prepares a Bulk Requisitions Indent which includes consumption during the last 3 years, consumption during the last 3 months, stocks held, quantity forecast, etc.

If the annual requirements submitted by the divisions/central workshops are within 110 to 115 % of the previous year's consumption, then these figures are taken as the final forecast, provided there are no major changes in the fleet strength. In cases where abnormal differences are observed in the requirements given by the units and the actual consumption in the previous year, the final quantity is determined on the basis of the recommendation of the Chief Mechanical Engineer.

## 7. Orissa SRTC

With complete decentralisation, all zonal officers

( depot managers ) procure materials independently for the respective zones. The demand forecast based on the past average annual consumption is prepared by the zones once in a year and forwarded to the Central Administration for budget allocation.

#### 8. Anna Transport Company

The material forecast is prepared on the basis of weighted average consumption during the previous three months. The consumption trend and future plans are also taken into account.

#### 9. Pandiyar Roadways Company

The demand forecast is made on the basis of average consumption during the preceding 8 months plus 10 % to cover any increase in consumption or delay in the delivery of supplies.

It is evident from the preceding discussions that there are significant differences in the materials planning systems and practices among the various state transport undertakings. However, the following broad observations can be made :

(1) In large sized undertakings, the requirements of divisions or regions are forecast at the divisional/regional

level and later consolidated at the central office. But in smaller undertakings, the materials forecast for the entire undertaking is prepared at the central office.

(ii) State transport undertakings, by and large, use simple arithmetic average of the consumption in the previous six months or one year period to forecast material requirements.

(iii) Methods like moving average, exponential smoothing, etc. which are considered to be better than simple arithmetic averages, for material forecasting have not been used by any state transport undertaking. These methods are particularly suitable when there are wide variations or trends in consumption as is often observed in transport undertakings.

#### Materials Planning in BERTC

The Inventory Control Section at the Chief Store, Pappannasode, is responsible for forecasting the requirements of spareparts and other materials needed for the operation and maintenance activities in the Corporation. As and when the stock levels of these items reach the predetermined reorder levels, a fresh order is recommended by the Inventory Control Section, the ordersize being depended on the anticipated usage rate during a specified number of months. Forecasts of monthly requirements are also needed to fix the parameters of the inventory control system such as minimum

stock level, maximum stock level and reorder level. Requirements are estimated from the previous six monthly or twelve monthly consumption data which are recorded in the Kardex and Review Cards. Using this various stock levels are worked out and the delivery schedule of material is also specified. The average past consumption figures are often revised upward or downward by the Assistant Controller ( Inventory Control ) to reflect anticipated changes in consumption rates. However, no clearcut procedures are laid down to forecast item demand or to adjust for trends and variations in the requirements of spareparts and other materials.

Materials required for body building and other production/ fabrication works are estimated by the Central Workshop, Trivandrum, on the basis of the anticipated body building/ fabrication programme. Although materials required for such jobs can be determined fairly accurately using bill of materials and norms of consumption, advance planning for materials was reported to be difficult since body building/ fabrication schedules are not often finalised sufficiently in time.

In depots, subdepots and other workshop stores also adequate forecasting of material requirements is almost



**CHAPTER - VII**

**PURCHASING SYSTEMS AND PRACTICES**

While materials planning determines the quantity and timing of material requirements, purchasing is responsible for supplying the materials. In its narrowest sense, the term "purchasing" refers merely to the act of buying an item at a price. This narrow concept of purchasing has gradually been broadened during the last 50 years. A broader definition of purchasing makes it a managerial activity responsible for providing the required quantity and quality of materials and services at the required time, at the minimum ultimate cost in line with corporate objectives.

The minimum ultimate cost of procured materials is primarily determined by purchasing. This is influenced by several factors like quantity, quality specifications, timing of purchase, supplier, extent of competition, method of purchase, mode of transportation, etc. all of which are not within the control of the purchaser. Several factors like quality, quantity and even timing are often established by the stores, inventory control and user departments. However, purchasing must challenge and negotiate compromises on matters that adversely affect materials pricing, so as to obtain the minimum ultimate cost.

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1 Robert B. Ballot, Materials Management : A Results Approach, New York, American Management Association, 1971, p.148.

### Importance of purchasing

The importance of purchasing can be gauged from the fact that in a majority of the industries and manufacturing operations, materials and services bought from outside contribute 60% of the cost of the manufactured product. In state transport undertakings, on average, materials account for 37 per cent of the total cost of operation. Hence purchasing controls a major share of the annual budget in these organisations and even a small percentage reduction in the cost of materials can result in significant amount of savings in absolute figures. This indicates the need for proper planning, execution and control of purchasing function in STUs and its potential for improving the overall performance of these undertakings.

Purchasing is the keystone of materials management. Most organisations have developed materials management around purchasing, often relegating the other functions to lower levels. In state transport undertakings also purchasing has been most often placed in the pivotal position, irrespective of whether the integrated concept of materials management has been adopted or not.

### Purchasing objectives

The purchasing responsibility is often defined as buying materials of the right quality, in the right quantity,



at the right time, at the right price, from the right source. This is a broad generalization and the significance of the definition depends on the interpretation of what is "right" which requires the consideration of many factors.

A more specific list of purchasing objectives, as relevant to the state transport undertakings may be summarized as follows :

1. To maintain continuity of supply to support operation and maintenance requirements.
2. To do so with the minimum investment in materials inventory, consistent with safety and overall economic advantage.
3. To avoid duplication, waste and obsolescence with respect to materials.
4. To maintain standards of quality in materials based on suitability for use.
5. To procure materials at the lowest cost consistent with the quality and service required.
6. To develop reliable sources of supply and to maintain good continuing vendor relationships.
7. To develop policies and procedures which permit accomplishment of the above objectives at the lowest reasonable operating cost.

### Purchasing function

The primary function of purchasing department in any state transport undertaking is to secure all material inputs needed for the operation and maintenance of the vehicles. The purchase is also usually responsible for procuring office supplies and items required for body building.

Any purchasing process starts with the recognition of the need for an item by someone in the organisation. Generally in STUs, the need for regularly consumed items like spareparts, tyres and batteries, is recognised by the stores or inventory control section which initiates a purchase requisition. However, for non-repetitive items items that are required for specific jobs, the requisitions are raised by the user departments. The purchase department may also, sometimes anticipate the requirements of regularly consumed items and buy them in bulk quantities without receiving any specific requisition.

The major functions of any purchasing department fall into three basic categories - materials sourcing, materials procurement and procurement services.

#### (1) Materials sourcing

Identifying, selecting and developing suitable sources of supply is an important function of the purchasing

department. It must select suppliers primarily on the basis of price, quality, delivery schedule and the services offered by them. The practices of maintaining registration of suppliers and rating their previous performance are extremely useful for identifying and selecting suitable sources. For branded or patented items like Tata or Leyland spares, there may be only a single source. However, for most of the other items, there will be a number of alternative suppliers from which one or more must be ultimately selected.

#### (ii) Materials Procurement

As indicated earlier, the stores, inventory control or user departments raise purchase requisition for materials. The purchase requisition must include all information necessary for purchase and must provide sufficient lead time for preparing and sending the purchase order and securing the materials. On receiving the requisition, purchasing must determine the vendor who will provide the quantity, quality, time, price and service to satisfy the requirement. It must prepare and process the purchase order promptly, clearly specifying the item, delivery, price and other terms.

Purchasing must ensure acknowledgement of the order and the vendor's agreement to perform and then continuously

communicate with him to get delivery of materials as per schedule. Continuous follow-up will minimise improper performance or will bring it to the attention of purchasing and inventory control sections in time to plan alternative action. The purchasing department is responsible for feedback of problems both to the user departments and to the supplier to minimise disruption of schedules and excessive costs.

Upon fulfilment of the obligation, purchasing must review the invoice, adjust it for any deviations from the agreed terms and conditions and process it for payment.

### (iii) Procurement Services

In addition to these routine functions, purchasing department must, in collaboration with other functions, investigate and identify methods for reducing the materials cost and improving the purchase performance. This may include conducting value analysis studies, make or buy studies, standardisation studies, forecasting the supply, demand and prices of major materials, simplifying and streamlining purchasing procedures, evaluating vendor performance and similar activities.

It must also examine how purchasing planning and decision-making can be aided by the use of techniques like

PERT/CPM, decision trees and dynamic programming.

### The Purchasing Cycle

The entire process of purchasing a material involves a sequence of steps forming a cycle. The cycle begins on receiving the purchase requisitions and completes when the supplier has been paid. The major steps involved are shown in Figure 7.1.

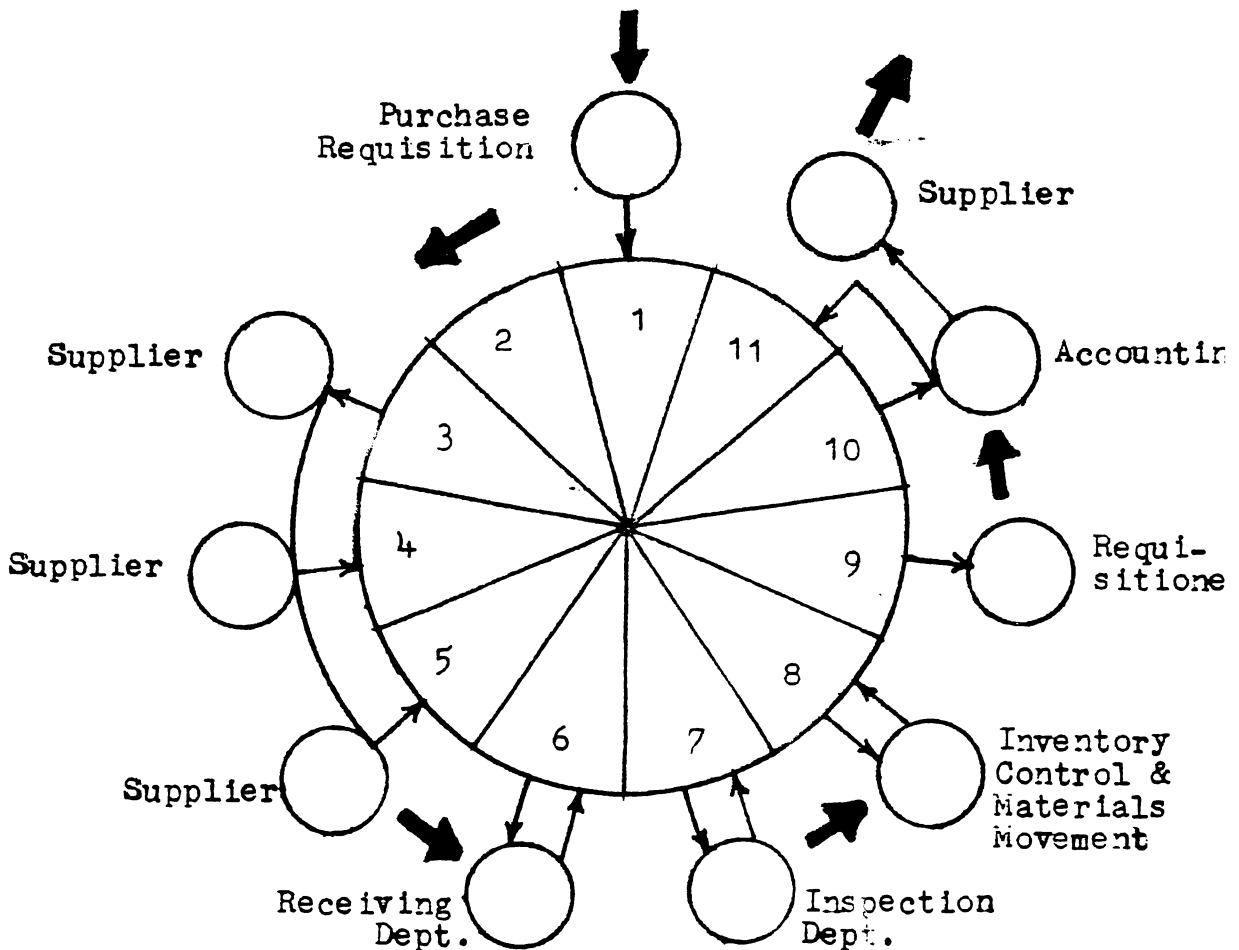
### Purchasing Decisions - Some Basic Considerations

What, when, how, how much, from whom and at what price to buy are decisions that must be made in the purchasing department. The classical definition of purchasing responsibility is to buy materials and services of the right quality in the right quantity, at the right price, from the right source and at the right time. The rightness of these decisions determines how well the responsibility is fulfilled.

#### 1. Right Quality

'Right quality' does not necessarily mean the best quality available, however desirable that might be. Purchases are made to meet specific requirements. Here quality must be determined by balancing two major considerations: (i) the technical consideration of suitability and (ii) the economic consideration of price and availability. Hence right

Figure 7.1  
The Purchasing Cycle<sup>2</sup>



- |  |   |
|--|---|
| 1 Review authority, Quantity and specifications.     | 2. Review suppliers, negotiate price & performance. |
| 3 Order placed with Supplier                         | 4 Order confirmation recorded                       |
| 5 Shipping confirmation recorded                     | 6 Order receipt information                         |
| 7 Order inspection information                       | 8 Order movement and inventory information          |
| 9 Requisitioner notified of availability of material | 10 Invoice checked and payment authorised           |
|  | 11 Supplier paid and purchasing notified            |

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2 Leonard J. Garrett and Milton Silver, Production Management Analysis, New York, Harcourt Brace Jovanovich, 1973, p.362.

quality can be defined as that which can be purchased at the lowest cost consistent with the requirements of suitability and service. Determination of the factor of suitability of an item rests ultimately with the departments responsible for the use and performance of the purchased item, even though it involves the risk that economic considerations may not always get the importance it deserves.

Quality must be defined for every item to be purchased and it must be expressed in such a way that

- (a) the purchasing department knows just what is required;
- (b) the purchase order or contract gives proper description of what is wanted;
- (c) the supplier is fully informed of the buyer's quality requirements;
- (d) suitable means of inspecting and testing can be applied to see that delivered goods meet the stated standards of quality; and
- (e) goods delivered in conformance with the quality definition will be acceptable to the buyer's organisation.

## **2. Right Quantity**

The second decision a buyer must make, after determining the right quality to buy, is how much to buy. The determination of the right quantity for purchase is crucial

because, if too small a quantity is purchased, the unit cost will usually be higher, shortages are likely to increase, expediting work will necessarily be greater, and the relationships between vendor and purchaser will probably suffer. On the other hand if too large a quantity is purchased, the excess inventory would raise costs, obsolescence and deterioration could be more and the need for additional storage facilities might create investment problems. A mathematical formula can be developed for determining the most economical ordering quantity by balancing the several opposing factors. This will be discussed in greater detail later in the chapter on Inventory Control.

Mathematical determination of the most economical order quantities is a useful device, particularly in respect of inventory items in regular use and is a guide in all quantity decisions. But it does not automatically provide the answer to the problem of deciding the right quantity to buy since several other factors are also to be considered. The important factors, having a bearing on the right quantity are summarized below.

#### Internal factors

- Quantity needed
- Type of need - isolated, seasonal or regular



- Shelf life or possible obsolescence of the item
- Costs of ordering and carrying inventory
- Service level required
- Storage facilities available
- Purchasing method adopted
- Type of inventory control system used
- Financial position of the organisation

### External factors

- Lead time
- Quantity discounts
- Trade customs
- Standard packages
- Transportation and handling costs
- Expected changes in delivery or price
- Characteristics and trend of the supply market
- Government regulations

### 3. Right Price

Price is a primary consideration in any purchase transaction. Professional buyers interpret the right price to mean a price that is fair and reasonable to both the buyer and seller. But it is extremely difficult to determine precisely what constitutes a "fair and reasonable price". Price must be evaluated in relation to the other factors as

a means to certain objectives of economical and efficient operation of the organisation. Price is meaningless unless it is predicated on adequate quality, assured delivery, reliability and continuity of supply and satisfactory commercial relations.

There are three basic methods by which a buyer can seek to arrive at the right price: published price lists, competitive bidding, and negotiation. Price lists are available for most of the standard manufactured items and office supplies carried by typical firms in their inventory.

Purchases through competitive bidding is widely followed by the state transport undertakings as well as by other government organisations in the country. The proper use of competitive bidding, as the best method of pricing available to a buyer, is dictated by five criteria.<sup>3</sup> The criteria are :

1. The value of the specific purchase is large enough to justify the expenses involved to both buyer and seller
2. The specifications of the item or service to be purchased are explicitly clear to both buyer and seller

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3 Lenar Lee and Donald Dobler, Purchasing and Materials Management : Text and Cases, New Delhi, Tata-McGraw Hill, 1977, pp. 97-98.

3. The market consists of an adequate number of sellers
4. The sellers comprising the market actively want the contract and are therefore willing to price competitively to get it.
5. The time available is sufficient for using this method of purchasing.

When all the above criteria prevail, competitive bidding may assure the buyer of obtaining the lowest possible price. However, if anyone of these criteria does not prevail, direct negotiation with suppliers must be used to arrive at a fair and reasonable price. Negotiation also, as in competitive bidding, seeks to exploit competition, though on a less formal basis. Negotiation generally covers the areas of quality, quantity, delivery and service as well as price. When adequate price competition does not exist, a fair price should be determined by first analysing costs, profit, and price and then by negotiation.

#### 4. Right Source

Selecting capable and willing suppliers is one of the most important responsibilities of a purchaser. It is sometimes stated that selection of the right source automatically takes care of every purchasing consideration; quality will be right, deliveries on time, prices fair and services good.

A buyer must consider several factors in selecting sources of supply. Detailed investigations must be carried out regarding the reliability of the prospective suppliers, their reputation, honesty and ability to supply the goods according to the standards and specifications prescribed. Information must also be gathered regarding the vendor's production facilities, processes and capacity, financial stability, technical competence, management and the industrial relations climate prevailing in the organisation. All these and other relevant factors must be carefully considered before selecting one or more acceptable suppliers.

After competent suppliers are selected, they must be assisted and motivated. Their performance must be periodically evaluated. The real test of supplier selection is, ofcourse, the satisfactory performance by the supplier once the order has been placed with him. His performance will determine whether he will continue to receive the buyer's business or will be replaced by another source.

#### 5. Right Time

Timing of purchases is often crucial in obtaining adequate quantity of material at the best price consistent with quality and service requirements. This is particularly significant in markets where supply and price fluctuate substantially, producing a highly unstable short-run

situation. The relevance and importance of purchase timing varies with the type of materials and characteristics of the supply market. Some of the major factors influencing the timing of purchases, are listed below :

- Quantity and timing of requirement
- Characteristics and trend of the supply market
- Purchase policy of the organisation, indicating whether to purchase according to current requirements or according to market conditions
- Lead time involved
- Inventory control systems used

All these factors must be considered while determining the right time to make a purchase.

### Analytical and Quantitative Techniques for Purchasing

Several quantitative techniques are now available to aid the purchasing executives in planning and scheduling their activities. Analytical techniques are also available for critically examining and challenging the design, composition and specification of materials, their manufacture, supply, cost and other aspects so as to identify and eliminate unnecessary costs in all possible manner. These techniques are being employed, in varying degrees, by several progressive

organisations in the public and private sectors in our country as well as abroad. State transport undertakings may also be able to improve their purchase decisions by employing these techniques.

Some of the most useful techniques for purchasing include :

1. Value Analysis
2. PERT/CPM and LCB Techniques
3. Decision Trees
4. Learning Curve, and
5. Purchase Budgets.

### 1. Value Analysis

Value analysis may be defined as the study of the relationship of design, function, and cost of any product, material, or service with the object of reducing its cost through modification of design or material specifications, manufacture by more efficient process, change in source of supply ( external or internal ), or possible elimination or incorporation into a related item. This technique was originally developed by Lawrence D. Miles of General Electric Company of USA during the post world war II period.

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4 Dean S. Ammer, "What Value Analysis Is All About", Purchasing, May, 1957, p.38

The techniques of value analysis represent a potentially powerful set of tools which can be used by management in controlling materials costs.

The unique feature of the value analysis study lies in the systematic and thorough approach used. The Value Analyst critically examines and challenges through a systematic procedure, each and every aspect of the quality specifications, design features, manufacturing processes and all other factors that affect material prices and costs in order to identify and eliminate all unnecessary costs.

There are two basic approaches in any value analysis programme namely design analysis and cost analysis.

The design analysis procedure involves a methodical step-by-step study of all phases of the design of a given item in relation to the function it performs. The product to be studied is exploded and the parts are scouted on a pegboard showing their functional relationships. Then each component is systematically analysed, examining whether they can be eliminated, or simplified or whether less expensive materials or production methods be used in the manufacture so as to reduce the overall cost without impairing the function. Value analysis checklists have also

been developed and widely used for design analysis as well as for other specialised applications.<sup>5</sup>

Cost analysis involves the investigation of a supplier's probable costs of producing a given product. The analyst constructs an estimated theoretical total cost and adds a reasonable profit margin. Although the calculated price is not exact, it provides the buyer with a powerful negotiating tool. It also serves as a means of locating high-cost parts which should be subjected to design analysis.

Experience of large number of organisations in this country as well as abroad shows that value analysis technique posses tremendous potential in reducing material costs and improving the profitability. The systematic procedure and techniques of value analysis can be used by state transport undertakings for reducing the overall cost of materials.

## 2. PERT/CPM and LOB Techniques

The methodology and uses of PERT/CPM and LOB Techniques

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5 P.V. Mahtev, "Value Analysis for Import Substitution", Indian Management, ( New Delhi), December, 1980, p.35



were described in the previous chapter on Materials Planning.<sup>6</sup> When purchasing is supplied with PERT/CPM network analysis, the most economical purchasing and traffic decisions can be made. For example, knowing how much slack time is associated with a delivery date, purchasing can select low-cost suppliers who may require relatively long lead times. Similarly, slower but cheaper forms of transportation ( for instance, by rail as against by road ) may be selected. PERT/CPM and LOB techniques are also valuable in expediting, because they indicate quickly when a crucial delivery deadline is missed.

### 3. Decision Tree

A decision tree is one of the most practical and useful managerial tools for structuring and visualising the complex relationship in a decision-making process.<sup>7</sup> It is a network representation of sequences of action event combinations that available to the decision-maker. Each possible sequence of decisions and consequences is shown by a different path through the tree. It helps to clarify the alternatives, risks, uncertainties and the monetary gains

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6 See Chapter VI, pp. 230 - 232

7 For details see P.V. Mathew, "Decision Tree : An Analytical Tool for Decision Making", Decision, ( Calcutta ), January 1981, p.30.

associated with decision problems so that they can be attacked systematically and logically.

Decision trees are especially helpful in analysing non-routine decisions that involve risk and substantial costs or potential rewards. Purchasing executives can greatly benefit from using decision-tree approach in several complex and uncertain decision areas in purchasing. Examples include make or buy decisions, selection of suppliers, timing of purchases under uncertainty of prices, supply etc. and decisions regarding limited tender, open tender and other methods of purchasing.

#### b. Learning Curve

Learning curve is a quantitative model of the commonsense realization that the per unit cost of a new product decreases as more units of the product are made. The cost should decline with each succeeding unit produced, as the supplier becomes more skilled or learns how to make the product. The more times a worker repeats a complex operation, the more efficient he becomes, both in speed and skill. Familiarity with an operation results in fewer rejects and reworks, better scheduling, possible improvements in tooling, fewer engineering charges, and more efficient management control.

Although the concept was developed in connection with new products, one might expect that to a lesser extent the learning curve also exists for products in which a company has had a long history of production. Winfred B. Hirschmann, in discussing this subject for the Harvard Business Review states, "No matter what products you manufacture or what type of operation you manage, there is a good possibility you can profit from the learning curve".

Studies made in the aircraft, electronics, and small electromechanical subassembly fields indicate that learning rates of 75 to 95 per cent are typical.<sup>9</sup> As more units are produced the effect of a constant rate on unit costs gradually diminishes. This is why learning curve analysis is of greatest value for new products. After several thousand units, the absolute reduction in cost from learning becomes negligible however.

Purchasing executives can use learning curve to analyze the effects of production and management "learning" on a supplier's unit cost of production. It is particularly useful in negotiations as a starting point for pricing a

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8 Winfred B. Hirschmann, "Profit from the Learning Curve", Harvard Business Review, January - February 1964, p.125

9 Lamar Lee and Donald Dobler, Op.cit., p.132.

a new item. Besides providing a check on overcharging by suppliers, the learning curve can also be used effectively in developing target costs for new products, in make-or-buy decisions and in determining delivery schedules. It is an invaluable aid in establishing an initial supplier-buyer basis for arriving at a fair schedule prices for complex custom-made products. However, buyers must guard against misapplication of learning curves since there are several production situations that do not exhibit continuing learning at a reasonably constant rate.

#### 5. Purchase Budget

Budgeting has long been recognized as a basic tool in managerial planning and control. Budgets are plans which state in quantitative terms certain expected results. They are basic planning devices for anticipating future cash flows and expenses within any department.

Purchase budgets can be prepared with the help of the material requirement plan discussed in the previous chapter. The quantity, specifications and the time schedule of the requirements are available from the materials plan. The purchasing executive must then formulate plans for the specific timing of purchases, taking into account the

procurement lead time, the purchasing method and other factors. The purchase quantities are multiplied by the estimated material prices for each item to arrive at the budgeted figures. Monthly or quarterly consolidation of the individual material budgets will give the time schedule and amount of funds needed for the procurement action.

Purchase budget serve as a planned programme for carrying out the purchasing function more intelligently and effectively during a given period of time. It gives the purchasing department the boundary limits within which it can operate. Deviation from the budget to either side will lead to extra costs. There should be a regular feedback and follow-up of the actual with the budget estimates and if there are any major changes foreseen, appropriate action should be taken.

#### Purchasing Systems and Practices in KERTC

The materials management department in KERTC is headed by the Controller of Purchase and Stores ( CPS ) as shown in Figure 5.14. The purchase functions are handled by two Assistant Controllers under the CPS, one for auto stores and another for general demand items. However, the purchase of tickets and stationery items required by all the units and

offices of KSRIC, is made by the Stores Officer (Stationary) attached to the chief office.

Purchasing in KSRIC is highly centralised at the chief office level. The entire stores requirements of KSRIC are bought and supplied through the central purchase office except local purchases in emergency situations.

There is need for greater decentralisation of purchasing in KSRIC as suggested in Chapter V.<sup>10</sup> Although this may result in some duplication of efforts at the divisional level, the possible benefits by way of better availability of materials at the operating units, reduction in local purchases and emergency indents and reduction in transportation and handling of materials from the chief stores will more than compensate the increased costs.

### Purchase Procedure

The recommendation for purchase is initiated from the inventory control section attached to the chief stores. The method and timing of issuing purchase recommendations varies for A, B and C category items. Stock Review cards are maintained for all A and B category items. Review periods

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<sup>10</sup> See p.219

and reorder levels are also fixed. Purchase recommendation for these items are noted on the stock review cards by the stores officer. It is examined and approved by the Assistant Controller ( Stores & Inventory Control ) and forwarded to the Controller of Purchase and Stores for approval. The purchase section issues purchase orders as per the approved recommendations. The approved cards are then returned to the chief stores for further review. However for 'C' category items stock review cards are not maintained. Purchase requisitions are prepared and forwarded in the prescribed format according to the review period and reorder level fixed.

Further, the Inventory Control Section indicates the follow-up action required through reminder slips, nil stock condition notes, etc. The purchase section follows-up and expedites the supply of consignments as required.

#### Method of Purchase

When purchase recommendations reach the purchase department, they issue purchase orders. The method of purchase generally varies for the different categories of items.

## **1. Proprietary Items**

If items are of proprietary in nature like the TATA, Leyland and Mico spares, they are bought from these original equipment manufacturers without any tender. The items are bought from these firms at the rates fixed by them which are not normally subject to negotiation. Steel items are bought from SAIL or Tata Sources, if available, without any tenders.

## **2. Rate Contracts System of the Standing Committee (Supplies & Contracts) of the Association of State Road Transport Undertakings**

Materials for which ASRTU rate contracts have been fixed, are generally bought from the rate contracted suppliers. If original equipment suppliers are available on rate contract, purchases are made invariably from them. Otherwise purchases are made based on the past experience with the suppliers and the competitive nature of the rates quoted.

The rate contract system of the Association of State Road Transport Undertakings (ASRTU) is explained in Appendix X.



### **3. Purchases as per the stores purchase rules of the State Government**

All other items are purchased following the guidelines given in the Store Purchase Manual of Government of Kerala.

The relevant provisions of the Stores Purchase Manual, as followed by the KSRTC are briefly explained below.

#### **Tender System**

1. A purchase officer should obtain stores by calling for tenders/quotations in all cases except the followings
  - a. The purchase of books and periodicals involving less than Rs. 500/- at a time.
  - b. Petty purchases of less than Rs. 200/- at a time.
  - c. Purchase from Government sources subject to the relevant provisions.
  - d. Controlled items of stores from controlled stocks.
  - e. Purchase of articles covered by rate or running contracts settled by the DOS & D, New Delhi or the Stores Purchase Department, Trivandrum by operating such contracts.
  
2. Quotations may be invited if the estimated value of the stores is below Rs. 10,000.

3. Tenders should be invited if the estimated value of the stores to be purchased is Rs. 10,000 or above. Tenders may be open tender, limited tender or single tender.

4. Open Tender :

The open tender system ( invitation to tender by public advertisement ) should be used as a general rule and must be adopted, whenever the estimated value of the contract is Rs. 10,000 or more subject to certain exceptions.

5. Limited Tender :

The limited tender system ( direct invitation to a limited number of firms ) may be adopted whenever the estimated value of the order to be given is less than Rs. 10,000.

6. The limited tender system may also be adopted instead of the open tender system even when the estimated value of the stores to be purchased is above Rs. 10,000 in the following cases :

- i. When it is not in the public interest to call for tenders by advertisement
- ii. When the articles are urgently required.

## **7. Single Tender :**

The single tender system may be adopted in the case of a small order or when the articles required are of a proprietary character and competition is not expected to be advantageous. For this purpose, a small order means an order the value of which does not exceed Rs. 100 or if more than one kind of article is ordered at one time, the total value of which does not exceed Rs. 200/-.

## **8. Acceptance of Tenders :**

In selecting the tenders to be accepted, the financial status of the tenderers should be taken into consideration in addition to all other relevant factors. If any firm is to be ignored on grounds of unsatisfactory performance, the decision should be taken by the Government. The various tenders should be compared in respect of price, quality, terms of delivery, terms of payment, etc. Other conditions being equal the lowest tender should be accepted.

In accepting tenders as above, indigenous manufacturers should be given preference. Government purchase policy generally permits a price preference upto 25 % or even higher in special cases, for indigenous products over imported stores.

**9. Preference to local manufacturers:**

The following price preference may be allowed for products of private industries within the State of Kerala over the products made outside the State, as a measure of encouragement to local small scale and cottage industries.

- a. 15 % for industries in which Government have taken shares
- b. 10 % for other industries
- c. 15 % for industries of registered charitable institutions.

Subject to the general price preference given above, a price preference upto 5 % may be allowed to products of medium and large scale industries within the state over those of similar industries outside the state.

**10. Purchase from Government Source :**

Products manufactured by state/central Government departments and public sector undertakings located within the state will be purchased from them exclusively without tenders. However this will be applicable only during the first five years after they have commenced production and the prices will be fixed by negotiations.

In the case of the above undertakings which have been in production for more than five years, tenders should be

invited and purchase should be finalised giving the concerned organisation a price preference of 10% as against firms manufacturing outside the state and 5 % as against firms manufacturing within the state.

#### 11. Rate and Running Contracts

All stores of standard types other than those required in small quantities only, which are in common and regular demand and the prices of which are not subject to appreciable market fluctuations may be purchased on the basis of a rate or running contract whichever is most suitable.

In the case of articles which cannot be stocked conveniently in the departmental store with safety and convenience, the system of running contracts should be adopted. A Running contract is a contract for the supply of an approximate quantity of stores at a specified price during a certain period. In terms of the conditions governing these contracts, the purchaser has the right to take a certain quantity ( usually 25 per cent ) over or below the approximate quantity mentioned in the contract.

A Rate Contract is a contract for the supply of stores at specified rates during the period covered by the contract.

No quantities are usually mentioned in the contract, and the contractor is bound to accept any order which may be placed upon him at the rates specified within the contract period.

## 12. Negotiated Contracts :

When substantial economy can be effected by deviating from the tender system, due to the immediate supply of certain special items, such items may be purchased, after negotiation, directly from its suppliers. This rule will apply only to patents and specialities to which tender system cannot be applied with advantage.

Besides the three general purchase methods described above, such as the purchase of proprietary items, ASSTU Rate Contracts and Stores Purchase procedure of state government, certain amount of local emergency purchases are also made. This is particularly necessary when critical parts go out of stock and the supplies are delayed.

### Purchase of Fuel

The method of purchasing fuel, High Speed Diesel Oil needs special mention. It is regulated by running contracts with the Indian Oil Corporation against which the unit officers are allowed to draw the quantity required from

time to time on local orders placed by them. The unit substore is responsible for the receipt, issue and custody of fuel and for the initial recording of the receipts, issues and balances. The accounts of the fuel transactions of the unit are kept by its stock accounts section while the responsibility for effecting payments for the purchases and for keeping the consolidated quantity accounts of fuel rests with Fuel Accounts unit attached to the Bill Section of the chief office.

#### Purchasing Methods in other STUs

The purchasing methods and policy of all the state transport undertakings, in general, are governed by the resolutions of the Corporations' Board or by the Departmental/government rules and procedures as the case may be. The methods normally adopted are as follows :

1. Propriety items like the Tata or Leyland vehicle spares and Mico or Lucas parts, are purchased from the chassis suppliers or original equipment manufacturers respectively.
2. Purchase from the firms on the rate contracts finalised by the Association of State Road Transport Undertakings, New Delhi.
3. Purchase from firms on the rate contracts entered

into by the respective undertakings.

b. Purchase by tender system, either open tender advertised in the press or limited tender invited from approved or registered suppliers, within the delegated powers.

5. Cash purchases of minor items from the local market in emergency situations.

Some of the salient features of the purchasing practices in other selected undertakings can be now examined.

#### 1. Andhra Pradesh ERIC

The purchase of materials in Andhra Pradesh ERIC is undertaken at two different levels namely Head Office and Regions. The responsibilities are clearly demarcated as shown below :

##### Head Office

- Rate Contract items of 'A' category ( Annual consumption value above Rs. 25,000 ) and upper 'B' category ( Annual consumption value between Rs. 15,000 and Rs. 25,000 )
- Other materials having annual consumption value above Rs. 25,000. These materials are generally bought through open tender.



- All forms, stationery items and body building materials.

### Regional Stores

- Proprietary items
- Rate contract items of lower 'B' category ( Annual consumption value between Rs. 10,000 and Rs.15,000 ) and all 'C' category items ( Annual consumption value less than Rs. 10,000 ).
- Other materials having annual consumption value less than Rs. 25000. These are generally bought by limited tender.
- Urgent purchases.

The consuming units, i.e. depots and workshops are also permitted to make local purchases of critical items in emergency situations.

For all annual bulk purchases either through open tender, limited tender or through rate contracts of AERTU, the selection of sources of supply is done by a high level Provisioning Committee consisting of the Chief Mechanical Engineer, Chief Controller of Stores, Deputy Chief Accounts Officer and the Deputy Chief Mechanical Engineer (Quality Control ).

Open tender system is followed when the items are standardised, sources of supply are many and the value of the order is more than Rs. 25,000 per item. When the sources of supply are few or when the value of the order is less than Rs. 25,000 per item, limited tenders are invited. The minimum number of enquiries required to be obtained for limited tenders are fixed as below:

<u>Purchase value/item</u>	<u>No. of enquiries</u>
Upto Rs. 3000	6
Rs. 3000 - Rs. 10,000	8
More than Rs. 10,000	10

In Andhra Pradesh SRTC also, small scale units are given price preference. In addition to this 185 items have been reserved for procurement exclusively from small scale units.

## 2. Gujarat SRTC

The requirements of operating units and central workshops are consolidated at the central stores and after reallocation of surplus stocks among the various units, the net requirement is intimated to the purchase department for procurement. The purchase department places orders on the suppliers, indicating the quantities to be delivered direct to divisions/workshops. But the specific delivery schedules

are given by the divisions/workshops, depending upon their needs, consumption pattern and stock position.

The major store items are grouped into three different schedules. The mode of purchase and selection of suppliers is different for each group.

- There are 13 groups of items, where irrespective of consumption value only limited tenders are invited.  
Examples : Drill bits, tyres, tubes & flaps,  
Aluminium materials, plywood, welding rods, etc.
- There are 29 groups of items where no tenders are invited but purchases are finalised on the basis of ASRTU rate contracts.  
Examples : Batteries, brakeliners, shock absorbers,  
voltage regulators, gaskets, piston.
- There are 27 groups of items where the Tender and stores Committee is the only competent authority for the selection of tenders irrespective of annual consumption value.  
Examples : Bearings, springs, radiators, engine oils,  
lubricants.

This group of items and other materials not included in any of the three groups may be purchased following tender

system. Limited tenders are invited for stores items whose annual consumption value is less than Rs. 50,000/-, whereas open tenders are issued if the value is more than Rs. 50,000 per annum.

While finalising tenders invited by Gujarat SRTC, the rates obtained in the ASRTU rate contracts are also taken into account, and suitable decisions are taken.

### 3. BEST Undertaking

This undertaking follows two systems of stocking and purchase known as casual Contract System and Annual Contract System. In the casual contract system, when the inventory reaches a fixed reordering level, a fresh order is placed for a predetermined quantity. The reorder level includes inventory for the lead time consumption and safety stock.

In the Annual Contract System, the order quantity may vary, but the reoccurment action is initiated at a fixed interval of one year. About 30% of 'A' category items in BEST Undertaking have been placed on the Annual Contracts. The indents for these items provide for 12 months requirements based on the average monthly consumption, as adjusted by the stock and outstanding quantity. These contracts are provided with plus or minus 25 % quantity clause.

The finalisation of Annual Contracts for the different items is spread throughout the year to balance the work load of personnel. The first orders against annual contracts cover upto 75 % of the total quantity and the balance is operated depending upon the exigencies. In order to control the level of inventories the deliveries are staggered as below :

<u>Value of Annual Consumption</u>	<u>Frequency of staggered deliveries</u>
<b>a) <u>Readily available items</u></b>	
1. Upto Rs. 2,000	Single lot
2. Rs. 2,000 - Rs. 12,000	3 times/year
3. Rs. 12,000 - Rs. 48,000	6 times/year
4. Rs. 48,001 and above	12 times/year
<b>b) <u>Manufactured items</u></b>	
1. Upto Rs. 4,800	Single lot
2. Rs. 4,801 to Rs. 24,000	2 times/year
3. Rs. 24,001 - Rs. 48,000	4 times/year
4. Rs. 48,001 and above	6 times/year

### Methods of Purchase

#### 1. Cash purchases

Cash purchases are made if the value of an item required is under Rs. 500 in an individual purchase.

## **2. Telephonic Quotation**

This is used if the value of the item does not exceed Rs. 3,000. About five quotations are called and the final decision is taken by the Stores Officer or the Assistant Controller of Stores and Purchase.

## **3. Rate Contracts**

ASRTU rate contracts are used both for Annual Contracts as well as for Casual Contracts.

## **4. Proprietary Items**

Proprietary items are bought from the vehicle manufacturers or the original equipment manufacturers without any tender.

## **5. Tender System**

Open or limited tenders are invited depending the category of items and their annual consumption value.

## **6. Karnataka SRTC**

In Karnataka SRTC, the purchases of all bulk requirements ( annual indents ) are centralised in the office of the Controller of Stores and Purchase. The annual indents from all operating units ( 12 divisions ) and regional workshops ( 2 units ) are centrally consolidated in a

systematic manner as per a calendar of schedules. A calendar of indents for both rate contract and non-rate contract items for one year is prepared and issued to all concerned by the Controller of Stores & Purchase. This calendar is based on the calendar of rate contracts published by the Association of State Road Transport Undertakings, New Delhi.

As per the calendar of schedules, the purchase orders for the annual requirements of all items for all the divisions and workshops are released by the Central Stores and Purchase Section, providing for direct deliveries to the indenting units duly staggering the supplies.

The sources of supply of materials in Karnataka SRTC are similar to those available in other STUs discussed earlier. They are :

1. **ASRTU Rate Contract holders**

All items which are on ASRTU rate contracts must be necessarily purchased from these firms.

2. **Vehicle manufacturers and single established manufacturers in the case of proprietary items.**

3 **Firms responding to public tender system for items which are not on rate contract or of proprietary nature.**

4. **Ancillary units sponsored by Karnataka SRTC to the extent of the quotas fixed for them provided their products**

are of acceptable quality.

### Vendor Rating Systems in State Transport Undertakings

Evaluation of the performance of major suppliers on a periodical basis, provides the buyer with objective information to use in subsequent negotiations and in making future source selections.

Several systematic procedures have been developed to evaluate existing suppliers on the basis of objective objective standards and criteria. The National Association of Purchasing Management, U.S.A., in one of its research studies on "Evaluation of Supplier Performance" investigated three evaluation techniques : the categorical method, the weighted point method and the cost ratio method.<sup>11</sup> The categorical plan consists of establishing a list of factors for evaluation purposes and assigning grades to all suppliers by personnel from different departments indicating performance in each area and finally arriving at a composite score in a joint meeting. The weighted point method provides for quantifying the evaluation criteria and assigning relative weights to them corresponding to the needs of the

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<sup>11</sup> See Lamar Lee and Donald Dobler, *ibid.*, pp.86-88



organisation. Composite performance index can be determined and suppliers can be rated on more objective basis using this method. The third evaluation technique, the cost-ratio method, relates all identifiable purchasing and receiving costs to the value of shipments received from respective suppliers. The higher the ratio of costs to shipments, the lower the rating applied to that supplier.

All these methods are designed to aid buyer judgement, and in some cases quantify what would otherwise be subjective analysis. If properly used, these techniques can help to make supplier selection more scientific and rational.

Analysis of the practices in various state transport undertakings shows that most of these undertakings do not have any formal systems or procedures for evaluating the supplier performance. They often go by the subjective judgements born out of their overall impressions and past experience with them. Kerala State Road Transport Corporation is no exception to this. However, the stores purchase manual of the Government of Kerala which is followed by the KSRTC, prescribes certain penalties and punishments to suppliers in cases of default, supply of defective materials, irregular supply and all cases of breach of the

terms of contract. The Government can impose on a supplier penalties such as blacklisting, banning, and supervision of business and removal from the list of approved suppliers according to the magnitude of the irregular performance of the contracts. But these steps are undertaken only in extreme situations. This does not provide for rating the relative performance of good suppliers and giving incentives and encouragement for improved performance.

BEST Undertaking is one of the few STUs following a formal system of performance rating of suppliers. In this system, grades - A, B, C, D & E - are assigned to the suppliers with respect to their performance in delivery, quality and life of the items supplied. Special factors in favour of the suppliers, if any, are also noted. The subjectivity in the evaluation is minimized by clearly specifying the conditions under which the different grades are to be assigned. However this system does not indicate any method for obtaining a composite score for each supplier so that comparisons can be made easily. Another draw back is that all the three factors - delivery, quality and life of the item - are given the same equal weightage. This system is explained in Appendix - XI.

It was reported that in Maharashtra SRTC also a

vendor rating card is maintained and a composite rating - Excellent, Good, Average & Unsatisfactory - is given based on past experience and overall impression about the suppliers.

Development of new sources and ancilliary units has also not been attempted by most of the state transport undertakings. Several public and private sector industries have reaped rich dividends by developing alternative sources and ancilliary units. Among the STUs only Karnataka SBTC has made some efforts in this direction.

#### Use of Analytical Techniques

Most of the analytical and quantitative techniques described earlier in this chapter can be beneficially employed in several situations in STUs. Value Analysis technique can be extremely useful in analysing and eliminating unnecessary costs in body building and major repairs and fabrication works. Challenging the existing specifications, design features, sources of supply, etc. of several of the items bought through public tender system will definitely yield good results. These methods have been well tried and found valuable in many organisations in this country as well as abroad and there is no reason why STUs cannot benefit from them.

Only very few STUs have made any serious attempts to practise these techniques. It is reported that Maharashtra SRTC used value analysis technique at its Dapodi Body Building Works and achieved substantial cost reduction.

Learning curve technique can be of use particularly while ordering non-standard type of items. Although the technique as such may not be applied, merely understanding the principles behind the technique can help the manager in arriving at better decisions. Similarly decision tree technique can help them in visualising the future alternatives and outcomes in situations like placing orders with new suppliers, timing of purchases in fluctuating and uncertain market, etc. PERT/CPM and LOB techniques are useful, in varying degrees, in body building, constructing and opening new bus stations, etc. and in planning major annual procurement operations. Purchase budgeting will be particularly helpful for overall planning and controlling purchasing activities and expenditures. State transport undertakings in this country are yet to realise the importance and benefits of using most of these modern techniques in their operations.

#### Delegation of Authority and Purchase Committees

Proper delegation of authority for purchasing at different levels in an organisation is crucial for the

effective and efficient functioning of purchase department. It determines how and at what levels purchase decisions are authorised to be taken and whether adequate authority has been delegated to lower levels in tune with their responsibility.

Inadequate delegation in state transport undertakings may result in vehicle down time and consequent loss in earnings due to non-availability of spares in time. Inability to procure such materials at unit level may lead to unnecessary delays and costs due to sending of 'SOS' requisitions, emergency purchases and rushing of materials to the indenting units. Above all, this will result in demoralisation and frustration for the personnel at lower levels due to the inability to function properly. On the contrary, if authority far in excess of what is genuinely required, is delegated it is likely to be misused. It may also lead to non-uniform policies and practices among the different units and coordination and control may become difficult. Hence determination and delegation of the most adequate levels of authority is very important for the effective and efficient functioning of the organisation.

One practice widely followed among STUs is to constitute purchase committees at different levels and delegate

authority to these committees rather than to individual managerial positions. But further research needs to be conducted to examine whether the common criticism that "committees are methods for delaying and avoiding decisions" is true with respect to these purchase committees. Delays in purchase decisions are probably more harmful than a little misuse of authority. Misuse can be minimised by clearly laying down policies and procedures indicating how and when authority must be exercised and by having proper checks.

The existing delegation of authority in KERTC and other selected undertakings is examined below.

#### 1. KARTI

The delegation of authority for purchase of materials at different levels is as follows.

##### 1. Controller of Purchase and Stores

He is vested with the powers to sanction purchases upto the value of Rupees three lakhs at a time, subject to observance of the purchase rules, provided that this delegation does not cover articles like tyres, batteries, paints, iron materials, etc the cost of the total quantity of each will be more than Rupees three lakhs in a year.

2. Assistant Controller (Purchase) - upto Rs. 2500/- per single purchase.

3. Authority for local purchase

(a) Works Manager, Regional Workshop, Edappal and Mechanical Engineer ( Works ), Pappanamcode - Rs. 3000/- per single purchase.

(b) District Transport Officer - Rs. 500/- per annum.

4. Proposals for the purchase of articles like tyres, batteries, paints, iron materials, etc. the annual cost of which will be more than Rs. three lakhs, are scrutinised by a committee consisting of

- (i) General Manager - as Chairman
- (ii) Controller of Purchase & Stores - as Convener
- (iii) Secretary to the Corporation- as member
- (iv) Chief Accounts Officer - as member
- (v) One Corporation Board member- as member

The sources from which such articles have to be purchased, are decided by the Corporation on the basis of the recommendation of the above committee.

## **2. Karnataka SRTC**

The powers delegated for purchase decisions in Karnataka SRTC varies for the different categories of items. It is observed that most of the powers are vested with several purchase committees constituted for the purpose as indicated below.

### **a. Rate contract items**

(i) Purchase value upto Rs. 5 lakhs.

Central Purchase Committee ( CPC ) consisting of Controller of Stores & Purchase, Chief Accounts Officer, and Chief Mechanical Engineers - Production and Maintenance

(ii) Purchase value above Rs. 5 lakhs

Departmental Tender Committee ( DTC ) consisting of all the members of CPC and the General Manager.

### **b. Proprietary items**

The Central Purchase Committee is delegated with full authority for all proprietary purchases, irrespective of monetary limits.

### **c. Purchase of Non Rate contract, Non Proprietary items**

In case of these items the indents are consolidated as



and tenders issued to known registered suppliers or manufacturers.

The delegation of authority of 'tender-items' is as given below :

- |                          |   |
|--------------------------|---|
| (i) Upto Rs. one lakh    | Central Purchase Committee  |
| (ii) Upto Rs. 5 lakhs    | Departmental Tender Committee   |
| (iii) Upto Rs. 15 lakhs  | Store Purchase and Works<br>Committee consisting of Vice<br>Chairman, General Manager and<br>three members of Corporation<br>Board. |
| (iv) Beyond Rs. 15 lakhs | Corporation Board   |

### 3. Andhra Pradesh SRTC

The extent of authority delegated to different levels in the organisation is as indicated below.

#### (a) Proprietary items

- |                            |   |
|----------------------------|---|
| Chief Controller of Stores | - Full powers                                   |
| Controller of Stores       | - Above Rs. 5000/- upto<br>Rs. 25000/- per item |
| Purchase Officer           | - Upto Rs. 5000/- per item.                     |



- Chief Controller of Stores -**
- i. Full powers with concurrence of CAO for items between Rs. 20,000 and Rs. 1 lakh
  - ii. Full powers for items between Rs.2000 and Rs.20,000
- Purchase Officer -** Full powers for items of value upto Rs.2000 per item

**(e) Single tender in emergency**

- Works & Purchase Committee -** Full powers
- General Manager -** Upto Rs 25,000 per item subject to a limit of Rs. 25 lakhs per year
- Chief Controller of Stores -** Upto Rs. 5,000 per item subject to a limit of Rs. 10 lakhs per year.
- Controller of Stores -** Upto Rs. 5000 per item subject to Rs. 3 lakhs per year.
- Purchase Officer -** Upto Rs. 5000 per item subject to Rs. 1 lakh per year.

**4. Gujarat SBIC**

The extent of authority delegated is as shown below.

1. Stores Officer (Purchase)/Asstt. Stores Officer (Purchase)	Revenue items having annual consumption value upto Rs. 25,000/-	Capital items valuing upto Rs. 5000/-
2. Departmental Committee II	Revenue items upto Rs. 1.5 lakhs consum- ption value	Capital items valuing upto Rs. 25,000/-
3. Departmental Committee I	Revenue items between Rs. 1.5 lakhs and 2.5 lakhs consumption value	Capital items valuing between Rs. 25,000 and Rs. 60,000/-
4. Tender and Stores Committee	Revenue items above Rs. 2.5 lakhs	Capital items above Rs. 60,000/-
5. Corporation Board	Purchase of USD Oil	

### Constitution of Committees

#### 1. Tender and Stores Committee

Chairman, Vice Chairman, Secretary and one official and three non official members. Deputy General Manager, Chief Accounts Officer and the concerned department heads as advisors to the Committee.

#### 2. Departmental Committee I

Vice Chairman & General Manager, Deputy General Manager,



2. Senior Stores Officer - Upto Rs. 1,000/-
3. Assistant Controller of  
Stores & Purchase - Upto Rs. 5,000/-
4. Deputy Chief Controller of  
Stores & Purchase - Upto Rs. 10,000/-
5. Chief Controller of Stores  
& Purchase, Deputy General  
Manager/General Manager - Upto Rs. 15,000/-
6. BEST Committee - Above Rs. 15,000/-

The above delegation is in effect since 1947.

The delegation of authority in different undertakings as described above shows wide variations in the practices and in the extent of authority delegation in these organisations. In order to get a clearer picture, comparisons of purchase authority delegated to two different levels - Controller of Purchase and Stores or the Head of Materials Management functions and Depot Managers in these undertakings is shown in Table 7.1. Although such comparisons do not necessarily indicate whether the extent of delegation practised in a particular organisation is really adequate, it does provide a means to understand the differences in practices.

Table 7.1

DELEGATION OF PURCHASE AUTHORITY IN SELECTED UNDERTAKINGS

Sl No	Undertaking	Head of materials management department	Depot Manager/District Transport Officer
1	Kerala SEIC	Rs. 3 lakhs/purchase	Rs. 500/- per annum
2	Karnataka SEIC	No individual limit. Authority is delegated to Committees in which Controller is a member	Not available
3	Andhra Pradesh SEIC	a) Proprietary and rate contract items - full powers	Rs. 300/- per vehicle per annum for depot Managers <u>At Regional level</u> Upto Rs. 25,000 per item

Table 7.1 ( contd.)

Sl No	Undertaking	Head of materials management department	Depot Manager/District Transport Officer
3.	Andhra Pradesh SHIC ( contd.)	<p>b) Open tender items - full powers upto Rs. one lakh, with concurrence of Chief Accounts Officer upto Rs. 2 lakhs</p> <p>e) Limited tender items - full powers upto 20,000 per item, upto Rs. one lakh per item with concurrence of Chief Accounts Officer</p> <p>d) Emergency purchase - upto Rs. 5000 per item ( single tender )subject to maximum of Rs. 10 lakhs/year</p>	<p>Upto Rs. 30,000 per item</p> <p>Upto Rs. 10,000 per item</p> <p>Upto Rs. 5,000 per item subject to maximum of Rs. 3 lakhs</p>
4.	Gujarat SHIC	No individual limits. Authority is delegated to Committees in which Controller is a member	Depot level - Not Available. Regional/divisional level - items having annual consumption value upto Rs. 25,000
5.	Maharashtra SHIC	Not Available	Rs. 25 per item without quotation. Rs. 100 per item with quotation.
6.	BEST Undertaking	Upto Rs. 15,000 per item	Upto Rs.500/- per item



The analysis shows the predominance of Committee system in Karnataka and Gujarat SRTCs and the absence of any separate purchase authority to the head of materials management department in these undertakings. A close examination of the pattern in other STUs indicates that the delegated powers to the Controller of Purchase and Stores in KERTC is more or less comparable to that of other undertakings. At depot level comparable figures were not available for all undertakings. However, judging from the extent of delegation at Regional/divisional levels, it can be stated that the authority delegated to DIOs in KERTC (Rs. 500/annum) is on the lower side as compared to other similar undertakings.

It is approximately to mention here that a National Workshop held in 1979 observed the inadequacy of purchasing authority for Depot Managers in Maharashtra SRTC and recommended that their local purchase powers must be enhanced to Rs. 100 per item at a time.<sup>12</sup> In KERTC also DIOs may be given local purchase powers upto Rs. 100 per item. A further suitable maximum limit per annum ( say Rs. 10,000 per annum ) may also be prescribed.

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12 V.G. Gurnani (ed.), Demand Forecasting in Inventory Control, Proceedings of the Workshop held from 28th to 30th November 1979, at CIRT, Pune, p.74.

In the light of the preceding discussions on the purchasing systems and practices in different STUs, a few suggestions can be made for KSRIC.

#### 1. Annual contract system

KSRIC may consider using annual contract system for selected major items ( considering ABC classification and other relevant factors ). As in BEST Undertaking, 25 % of quantity clause can be included to make the contract slightly flexible. Order for upto 75 % of the estimated annual requirement may be placed at the first instance, the balance can be ordered subsequently depending on requirements. This method has the advantage of reduced purchase order costs and price and turnover discounts.

#### 2. Staggered and direct delivery

Suppliers can be asked to deliver the materials directly to the divisional and/or Central stores as the case may be. Specific delivery schedule can also be given in tune with the requirements of divisional/central stores as in Gujarat SRIC. Since the deliveries are staggered and supplies are made directly to the indenting units inventory control is to a large extent in-built into the system and distribution costs will be significantly reduced.

### **3. Vendor rating and source development**

**KSRIC must evolve formal systems of rating the performance of major suppliers and use it for negotiation and future source selection purposes. Slightly modified version of the system in BEST Undertaking can be adopted. Development of new sources and ancilliary units must also be undertaken more seriously.**

### **4. Analytical techniques**

**Analytical techniques, particularly Value Analysis must be used in body building, major repairs and fabrication works and in the purchase of major non-proprietary and multi-source items.**

### **5. Delegation of authority**

**The adequacy of the existing levels of delegation of purchase authority must be examined. Delegated powers at lower levels may have to be enhanced.**

### **6. Purchase Manual**

**KSRIC does not have any purchase manual of its own. Presently it follows the purchase manual of the Government of Kerala which is often found to be inadequate for an organisation like KSRIC, which is expected to be run on business principles and required to provide efficient and economic service in a competitive environment. Hence KSRIC must**

undertake to prepare a Purchase Manual for its purpose, clearly laying down suitable policies and procedures, emphasising the overall performance and results rather than procedural subtleties.

\*\*\*\*\*



**CHAPTER . VIII**

**STORES ORGANIZATION AND CONTROL**

Investment in material inventories often represents a substantial portion of the total current assets of a state transport undertaking. Therefore it is a primary responsibility of management to establish methods for safeguarding the material inventories in an undertaking. Physical control over inventories is normally vested in the storekeeping function. The most important objective of stores is not to stock materials as such, but to provide service to the engineering departments in road transport undertakings. This consists of the following functions :

1. To provide a balanced flow of fuel, lubricants, spareparts, tyres and tubes and flaps, batteries and general stores necessary for meeting operational and maintenance requirements.
2. To receive, check and arrange for inspection of all incoming materials and account for them.
3. To provide adequate and proper storage and protection to the various items.
4. To issue materials to user departments against indents.
5. To minimise obsolescence, surplus and wastages through proper codification, standardisation, presentation, handling and selective control.
6. To maintain stores areas in a neat and orderly manner.

7. To maintain accurate stores records and provide supporting information for effective materials planning, purchasing and inventory control.

"Stores" is a general term describing goods which are held in store houses and stock yards. This may include raw-materials and components to be used for production, tools, spareparts and supplies, finished goods, scrap and waste materials and general stores items. The expression "Stores" is also used to denote a store-house or place where goods are stocked.

#### Service Versus Cost

The primary objective of stores department is to provide service to the user departments, to make available materials as and when required by them. But this does not imply that the service must be provided without any consideration of the cost incurred in the process. It is obviously desirable to provide the service economically. In order to give a high level of service ( either nil or negligible stockout ), excessive amount of inventory must be maintained. This involves the following major costs.

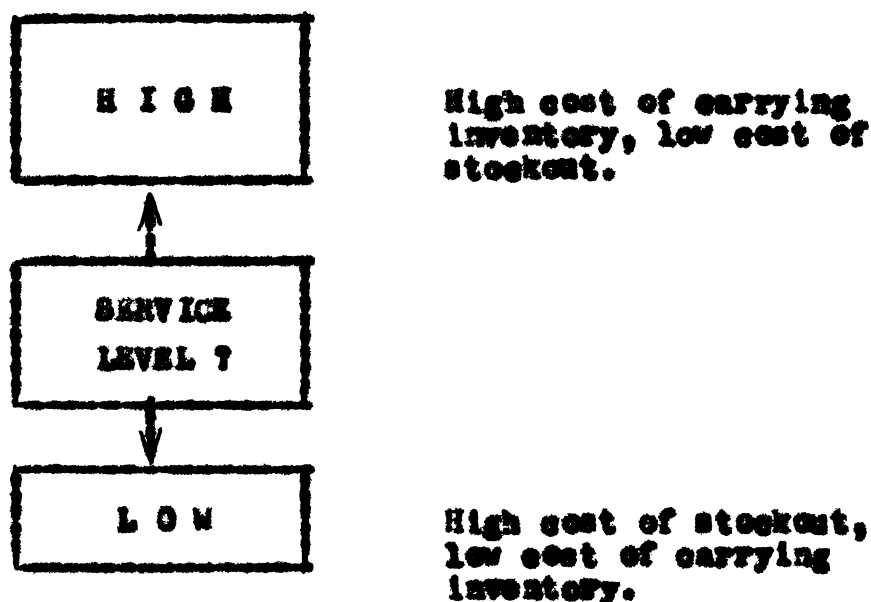
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1 A. Morrison, Storage and Control of Stock, London, Pitman Publishing, 1977, pp. 9-11.

1. The cost of the money invested in the stocks which can be more or less equated to the bank lending rate.
2. The cost incurred on the physical storage facilities, in the form of rent, maintenance charges and depreciation charges.
3. Additional costs due to obsolescence, deterioration, evaporation and other natural losses due to storage of items for longer periods.
4. Losses in the stores due to pilferage, wastage, breakages, mishandling, etc.
5. Insurance costs.
6. Salary and other benefits to stores personnel.

All these costs generally vary directly with the level of stock. However, there is another type of cost which behaves in the opposite direction. It is the understocking cost or the cost of stockout. It measures the losses due to reduced service level, or the non-availability of material in time. In STUs, for instance, non-availability of spareparts may result in loss of revenue, extra costs in expediting supply or in local purchases, additional costs due to use of inferior substitutes, etc. With low level of inventory and more frequent purchases these costs tend to increase.





Hence determination of the optimum level of service requires the balancing of these two opposing costs. A decision on the service level has wider implications and it cannot be taken by a stores officer in isolation. However, he can often influence several of these costs by appropriate systems, procedures and controls of the physical inventory as well as by proper utilisation of the storage space and personnel.

#### Stores Organisation and Practices in KSHTC

The stores set up in KSHTC consists of the Chief Store at Trivandrum, Regional Chief Store at Alwaye and 45 sub-stores which include 24 depot stores, 12 subdepot stores and 9 workshop stores.

The Chief Store, Trivandrum, the Regional Chief Store, Alwaye and the Inventory Control Section at the chief office are under the direct control and supervision of the Assistant Controller ( Stores and Inventory Control ) as shown in Figure 8.1. However the stores officer (stationary stores ) reports to the Assistant Controller, Purchase ( General Demand ).

#### Chief Store, Trivandrum.

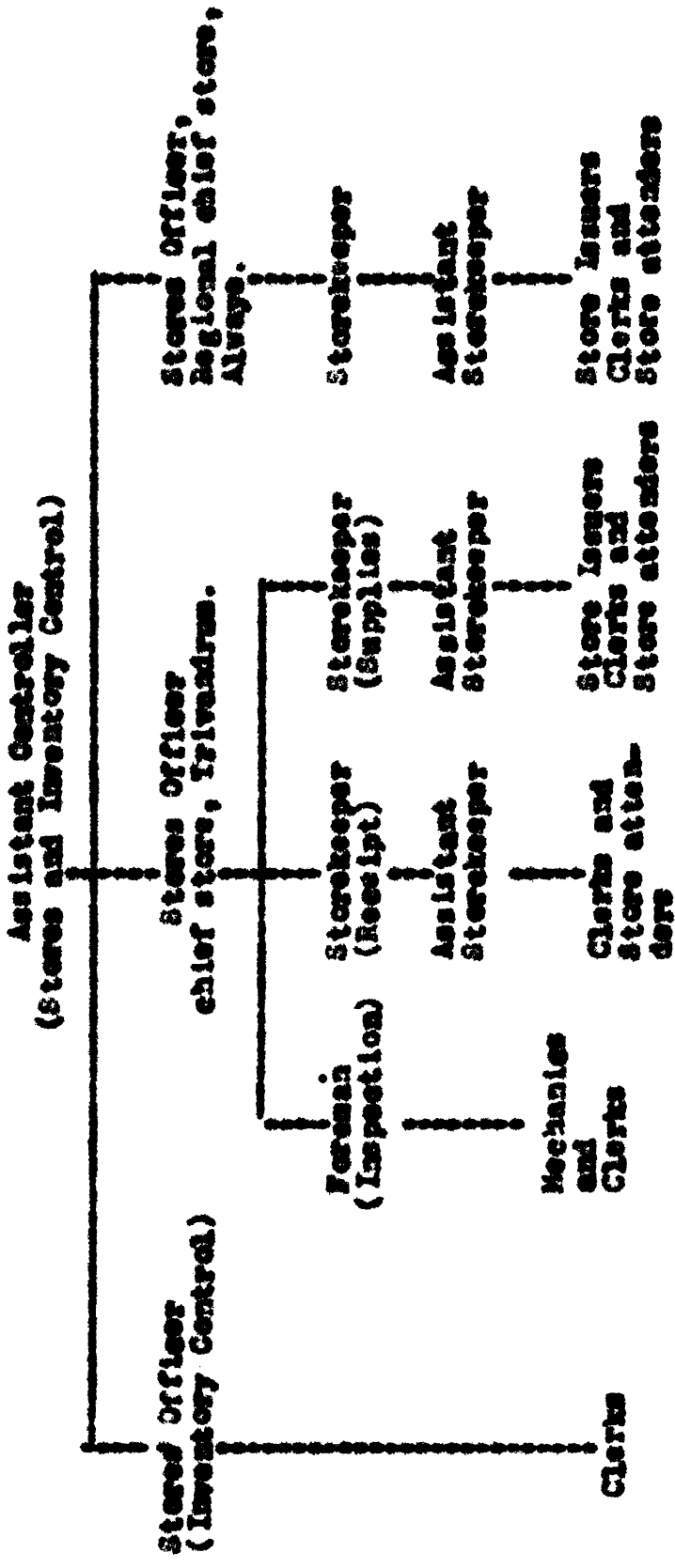
The chief store at Trivandrum functions as a central store. The supplies from vendors are received at the chief store. Materials for the substores in the southern region are issued directly from the chief store while the substores in the northern region get the replenishments from the Regional Chief store, Alwaye. All the regional and divisional workshop stores except the regional workshop store in Alwaye obtain supplies from the chief store, Trivandrum. This is shown in Figure 8.2.

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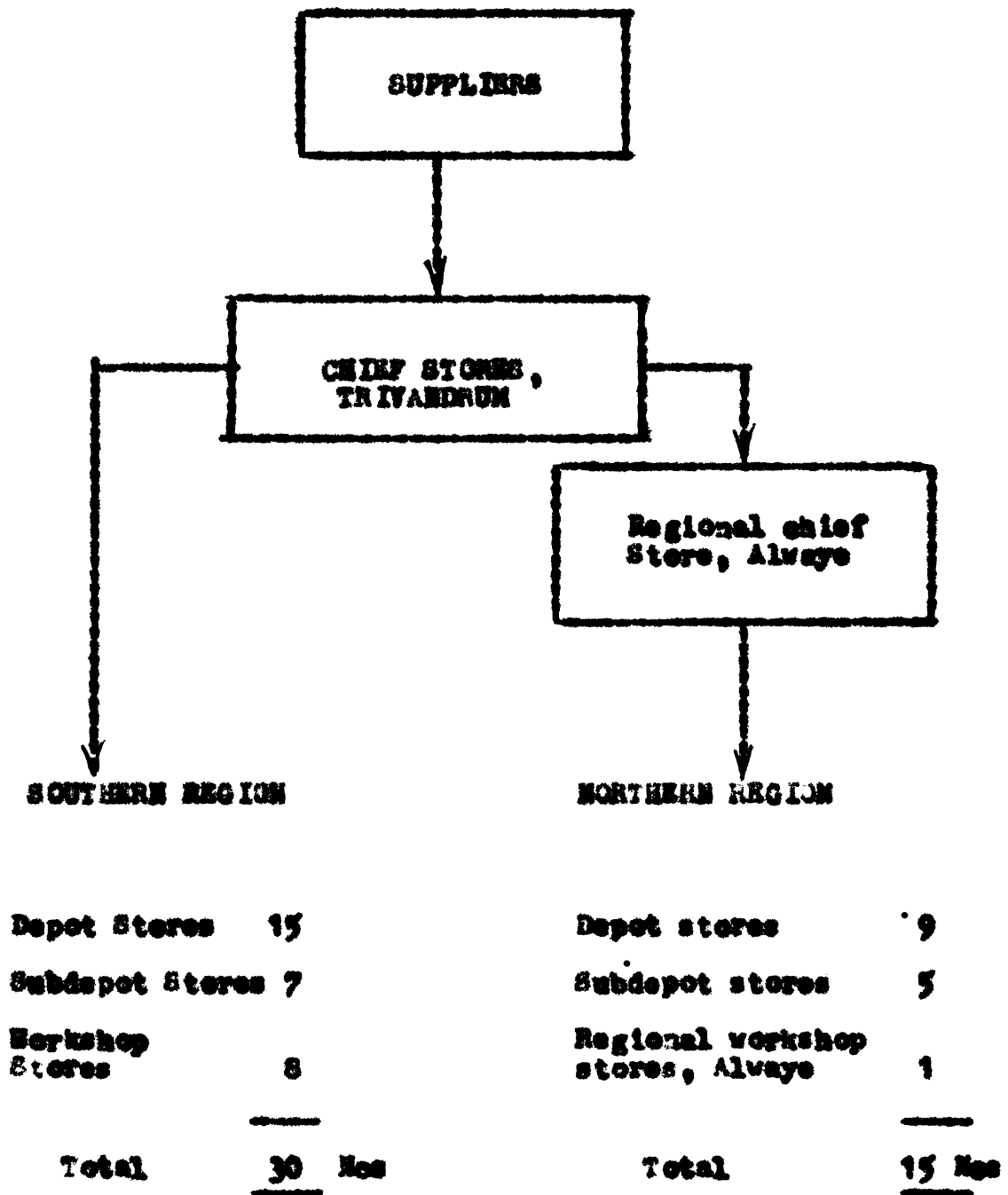
#### Chief Store, Trivandrum.

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**Figure 8.1**  
**STORES ORGANIZATION IN HUNGARY**



**Figure 8.2**  
**FLOW OF MATERIALS IN KORTC**



The chief store stocks above 500 9 items. They consist of the following major groups.

- spare parts
- lubricants
- Tyres and tubes
- Batteries
- Uniforms
- Tools and miscellaneous equipments
- Other stores
- Building materials

The stores officer, who is in charge of the store, is assisted by one Foreman ( Inspection ) and two Storekeepers, one for receipt and the other for supply. The Foreman ( Inspection ) arranges for the inspection of all incoming materials and reports the findings. The storekeeper ( Receipt ) is responsible for the clearance of goods from the railway/transport godowns and receiving the same at the store. The storekeeper ( supplies ) is assisted by 10 Assistant storekeepers. They are responsible for the safe custody of materials and for issuing them as per indents. Each Assistant storekeeper is allotted a group of items as indicated below.

Assistant Storekeepers (Supplies)	Item categories	Approximate Number
Ask - 1	Tata Engine, clutch and gearbox spares	750
Ask - 2	Tata Chassis spares	600
Ask - 3	Leyland engine, clutch and gear box spares, Leyland double decker spares	800
Ask - 4	Leyland and Tata common spares, brakeparts, Auto Electrical parts & Misc spares	700
Ask - 5	Leyland Chassis spares	400
Ask - 6	General demand items, light hardwares, retreading materials	350
Ask - 7	Tools and equipments and their spares, can, Jeep and Van spares.	900
Ask - 8	Tyres, tubes and flaps	25
Ask - 9	Heavy hardwares and lubricants	200
Ask -10	Deadstock items	400
Total ( Approx. )		5125 Nos.

### Regional Chief Store, Alwaya

The Regional Chief Store, Alwaya, from where supplies are made to the substores in the northern zone, stocks between 25000 and 30000 items. It obtains materials from the Chief Stores, Trivandrum, through monthly and other indents. The Regional Store is headed by a stores officer who is assisted by one store keeper and four assistant store keepers, one each for Tata spares, Leyland spares general items and miscellaneous items.

### Depot/Subdepot Store

A typical depot store stocks between 1500- 2000 items. It is headed by a store keeper who reports to the District Transport Officer. He is assisted by three assistant store keepers, one each for Tata spares, Leyland spares and other items. Besides, there would be a clerk looking after the fuel accounts.

Around 1000 items are stocked in a subdepot store. It is controlled by an assistant store keeper who reports to the Assistant Transport Officer. He is assisted by store assistants and attenders.



### Workshop Store

The Central Workshop Store, Pappannocuda has a large set up compared to the other workshop stores. Besides, the materials required for the general workshop, all the body building materials are also stocked here. A stores officer, under the Works Manager, looks after the store. He is assisted by two storekeepers and 12 assistant storekeepers.

A typical Regional Workshop store is headed by a storekeeper who reports to the Works Manager. He is assisted by four assistant storekeepers and several stores assistants.

All major units such as engine, gearbox, front axle, rear axle, dynamo, starter, radiators, etc which can be made use of after reconditioning are supplied through these workshop stores on receipt of old ones.

### Clearance Store, Ernakulam

There is a clearance store attached to the Water Transport Office, Ernakulam, where the clearance of lubricants and other materials from Ernakulam are made. Lubricants to all the units are distributed from this

stores, except for the units in Trivandrum where the supplies are made through the chief store, after getting sufficient stock from the clearance store.

### Stock Accounts

The accounts pertaining to the Chief Store, the Regional Chief Store and the Clearance Store are attended to in the Stock Accounts Section of Chief Office. Bin cards are also maintained in the respective stores. Accounts relating to other unit offices are attended to by the unit officers themselves. The fuel accounts are maintained by the unit officers although the consolidated accounts is maintained in the chief office.

### Stores Systems and Procedures

#### Clearing and Receiving

All the supplies, except fuel and lubricants, are directly received, inspected and stored at the Chief Store. The suppliers send the goods by rail or by lorry transport and negotiate the documents through bank. The bill section attached to the Chief Store clears the documents from the bank and entrusts the same to the Stores Officer ( Chief Store ). The Assistant Store keeper ( Clearance ) arranges

to clear the goods and transport them to the chief store.

The Assistant Store keeper ( Receipt ) receives the materials and arranges for unpacking and inspection. Foreman( Inspection ) inspects the goods to ensure that they conform to the Purchase Order and are of acceptable quality. Discrepancies, if any, are noted. In case of discrepancy, a discrepancy report would be prepared and submitted to the Stores Officer, who would take up the matter with the supplier under intimation to the Controller of Purchase and Stores and Bill section. For the supplies received in proper condition, the Assistant Store keeper prepares a Material Transfer Note and the materials are transferred to the concerned section under the Store keeper (Supplies), along with a copy of the material transfer note. The Assistant Store keeper in charge of the Section prepares a Goods Received Note for the materials so received. They will also account the same in their Bin cards and supplies are made to various units against indents.

### Bin cards

Bin cards are maintained at the stores for each item. These cards show the part number, material description, unit of issue, storage location, date of transaction, receipt or issue voucher number, receipts, issues and stock balance. The bin cards are arranged on classification and code

number basis and placed in a tray in the respective sections of store.

### Issue of materials

The spareparts and other items of stores stocked in the Chief Stores and Regional Chief Stores are distributed to depot/subdepot stores and workshop stores on the basis of their indents. The monthly indents of these sub-stores are ordinarily sent before 10th of each month to the Chief/Regional Chief Stores and supply is made from 15th to 20th of the month. In addition to the monthly indents 'Emergency' and 'VCR' ( Vehicle Off Road ) indents are also sent by the depot/subdepot stores. Emergency indents are sent when the items in question are completely out of stock in the depot/subdepot store and VCR indents are initiated when vehicles are off-road and they cannot be repaired for want of spareparts. There is no restriction on the number or timing of these indents and available items are immediately supplied to the indenting units.

The D.I.Os and A.I.Os in charge of the Depots and Subdepots respectively, make local purchase of spareparts in case a particular item which is required to put the vehicle on road cannot be obtained either from the Chief Stores or from any of the nearby depot stores.

### Tyre card

The store keepers in the sub-stores attached to the operating units maintain a bin card for each item of store. In respect of tyres, a 'tyre card' showing the description and performance of each tyre is maintained in the operating units. Particulars like make, size, date of purchase, vehicle to which fitted, distance covered, date of retreading, etc. from the date of purchase to the date of scrapping of the tyre is maintained. The maintenance of the tyre cards is the responsibility of the Tyre Inspector. Holding stock of tyres, tubes and flaps for each depot has been fixed based on the number of buses in the depot. Whenever tyres are sent for retreading or scrapping, the stock is replenished from the Chief Stores.

### Stock Verification

Perpetual verification of the stock is conducted by the Stock Verification Section of the chief office. The stock items to be checked are selected against a pre-determined plan. The actual count is checked against the inventory record. The results are reported in the stock verification sheets. Shortages and surpluses detected are brought to account through issue notes and goods received notes.

### Valuation of Stock

Material issues and stock balances are valued by the Stock Accounts Section using weighted average method. Every time stocks are received, the issue price is calculated afresh on the basis of the weighted average price of the total stock on hand. This method is reported to be followed by most of the state transport undertakings.

### Store keeping Practices in selected STUs - Some salient features

#### 1. Maharashtra STTC

The Depot Stores hold the stocks of spareparts, fleet assemblies, tyres and tubes, batteries, lubricants, etc. and obtain the replenishments from the Divisional Stores against i) Monthly consumption and recoupment indents, ii) Casual indents whenever consumption increases, iii) Vehicle Off Road indents in case of vehicle going off-road for want of spareparts and iv) reconditioned assemblies or retreaded tyres from the Divisional Workshops, on exchange basis. The Divisional Stores receive their supplies as under :

- i. "A" and "B" group of auto stores, from the Central Stores, against Stock Review Statements for the items whose stock levels have reached re-order level.

ii. "C" group of auto stores, from the suppliers directly, under purchase orders placed by the Regional office, against stock review statements submitted by the Divisional Stores.

iii. "A" and "B" group of items for Divisions upto the re-order level, for the vehicles off-road only, are also handled by the Regional office.

iv. Depot float items of general stores, from the Central Stores, against monthly consumption and receipt statements.

v. Other items of general stores, also from the Central Stores, against monthly indents, based on the calendar of indents.

The central workshop places indents for the materials required, on a calendar basis, to the central office. The items available at the central stores are supplied immediately and for the balance, purchase orders are issued by the central office, on the suppliers, to deliver the materials directly to the Central Workshop Stores.

The Central Store stocks category 'A' and 'B' items of auto stores for Divisions and all categories ( A, B & C ) of auto stores as well as a few general stores items for central workshops. It receives supplies from the vendors against purchase orders released by the Central Office.

## 2. Andhra Pradesh SRTC

The provisioning of "A" and "B" class items is made by the Stores and Purchase department at Head Quarters, whereas "C" class items are handled by the Controllers of Stores at "Area" levels.

The issues of materials to the depots are based on the requirements given by the indents. A standard list of items to be issued to the Depots has been prepared based on the type of vehicle operating and the quantities are also laid down for guidance. In case of issues to the workshop, there are no prescribed norms but return of old and unserviceable materials in exchange for new ones, is insisted upon.

Perpetual stock verification is carried out at APSRTC.

## 3. Gujarat SRTC

The Central Store holds stocks for the central workshops only and not for the Divisions. The depots obtain their monthly replenishments from the Divisions. About 600 items each of Tata and Leyland vehicles have been standardized to be stocked at the Divisions.

GSRTC has a system of fixing annual consumption control limits for selected items in every divisions. This is



worked out by the Mechanical Engineering department and communicated to the concerned divisions for appropriate action. Divisional engineers keep depotwise consumption record of these items so that they can watch the consumption trend and take control action whenever necessary. The annual consumption control limits are worked out keeping in view of the total value of items used, value of items selected for control, desired reduction in cost/consumption, expected increase in operation, etc. The number of selected items is kept small so that effective control can be exercised by the Divisions.

#### 4. HEAT Undertaking

Bin cards are maintained in each stores depot for recording the description of an item, receipts, issues and balance. These cards also indicate i) monthly issues, ii) average monthly consumption, iii) minimum stock level, and iv) details about the last purchase order placed and the quantities outstanding therein.

The replenishment of the stocks is done on the basis of the following indents :

- i) Reorderment advices, when the stock on hand and on order outstanding reaches a fixed reorder level.
- ii) Minimum Stock Level Advices, when the stock on hand

and on order outstanding reaches a fixed Minimum Stock Level.

iii) Low Stock Form, when the actual stock on hand reaches a fixed low stock level.

To illustrate the various stock levels, readily available items with consumption exceeding Rs. 2000/- per year :

Reorder level	= 6 months ( stock + outstanding order )
Minimum stock Level	= 3 months ( stock + outstanding order )
Low stock Level	= 3 months ( stock on hand only )

#### 5. Madhya Pradesh SBIG

Depot stores receive their replenishments every month from the Divisional Stores. The Divisional Stores submit the Stock Review Statements to the Central Stores and obtain their supplies either from the Central Stores or directly from the vendors, against purchase orders placed by the Stores and Purchase Department at Head Quarters. A similar procedure is followed by the Central Workshop Stores also. About 950 items have been standardised for the Depots and stock equivalent to 2½ months' consumption is kept at the depots.

### Material Codification

Unless the stores personnel are able to identify the items instantly, they will not be able to provide a good service. Hence it is essential to specify and identify each and every item of stock in a unique and accurate manner.

Identification is the process of systematically defining and describing all items of stock. The normal way of identifying an article is by simple description, but this by itself is not entirely satisfactory for stores purposes. Several different names may be used for the same thing. Again, in order to identify some articles accurately, a very long and complicated description is required. It is necessary to have some logical basis of identification which is more precise and less cumbersome. It will facilitate a systematic grouping of similar items and will ease the process of standardisation. Items can be easily located in the stores, duplication can be prevented and the service levels can be improved for the same level of investment.

One of the best methods of unique identification is \_\_\_\_\_ rationalised codification of stores. This can be done by using letters or figures or a combination of both in the form of a stores code. A well designed codification system will have the following characteristics :

1. It covers the whole range of stores in use or likely to be used in future.
2. The number of letters or digits is constant for all items.
3. Numbering is arranged so that there is adequate room for future expansion, without the risk of duplication or changing existing members.
4. The code structure must be precise in that only code may be correctly applied to a given item.
5. It should require the least possible number of digits to adequately describe each item.
6. The codes must be easily understood by the users.
7. If possible, the code itself should indicate some of the characteristics of the items.

In any stores organisation there are normally two types of items, stock items and non-stock items. Stock items are those that are procured regularly, kept in storage and issued as per indents. Non-stock items are those that are procured only upon specific requirements and are issued out at once. It will be advisable to codify only the stock items in any organisation.

There are many different kinds of stores codes in use, and most of them are specially designed to suit the needs

of the business they serve. They may be based on the characteristics of the stock items, the purpose for which items are employed or any other basis suitable to the requirements of the organisation.

One of the earliest developed methods is the British system of codification. It uses a seven digit code. Within the preliminary set of categories, items are classified according to the materials, use, size and functions such that similar items are brought together. Another established system is the Kodak system which consists of ten digits. In this system, in addition to the classification based on materials, use and function of the item, importance is given to the mode of procurement of the item by the first two digits. These two systems or their modified versions are being used by several enterprises for coding their stores. A suitable system of rationalised codification is essential for the efficient working of stores in state transport undertakings. Even in a medium sized STU, the total number of items stored may run into several thousands and their clear identification becomes difficult in the absence of a suitable codification system.

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2 For an excellent discussion on the different coding methods and their uses, see James H. Green (ed.), Production and Inventory Control Handbook, New York, McGraw Hill, 1970, pp. 14.6 - 14.14.

## Standardisation and Simplification

According to the International Standards Organisation, Geneva, "Standardisation is the process of formulating and applying rules for an orderly approach to a specific activity for the benefit and with the cooperation of all concerned, and in particular for the promotion of the overall economy, taking due account of functional conditions and safety requirements."

Standardisation of materials is the determining of fixed sizes, shapes, quality, composition and dimensions of material. Such standards and specifications are often evolved by national and international standards organisations. Individual organisations may follow these standards or develop its own to suit the particular circumstances.

Simplification of stores is the process of reducing the number of varieties of standard items stocked to a workable minimum. Unless active measures are taken to control variety, the number of items stocked and used will gradually increase in any organisation. When this has been going on over a long period, if the position is examined critically, it will be found that there are many instances where several items of a very similar nature are purchased and held in stock.

The simplification programme involves a complete examination of the materials stocked, to determine -

1. the use or uses for which each item is intended
2. the usage rates for each type and size of item
3. which items have similar characteristics
4. what range of sizes is essential
5. which items can be eliminated
6. what specifications are necessary for retained items.

This analysis will reveal the scope for significant reduction in the variety of stores. A rationalised system of codification can greatly help the process of simplification.

Standardisation and simplification of inventory items result in substantial cost reduction and better service to the user departments by way of :

- reduced inventory investment
- more economical buying
- easy identification and order processing
- reduced shortages and obsolescence
- reduced clerical and handling costs.

#### Codification in KBRIC

The stores items in KBRIC are broadly classified into Auto Stores and General demand items. All the auto and

general demand items handled by the KERTC stores were compiled in 1975, and a "Standard Spare Parts List"(SSP List) was prepared. This was meant to serve as a reference list which would help in maintaining uniformity in intending, buying, storing and stock accounts. The SSP List gave the correct nomenclature and code numbers for all the items.

The method of codification differs for auto parts and general demand items. For auto stores, which consist of spareparts for Tata and Leyland vehicles, separate codes have not been developed. The Original Equipment ( O/E ) manufacturer's codes are being used for these items. For instance, for Tata spares, 10 digit Tata part numbers and for Leyland spares, 6 digit Leyland part numbers are being followed in KERTC. Similarly for other original equipment manufacturers like Niss, Ineos TV and Sundaram Clayton, their own part numbers are being used.

However, for the general demand items a 9 digit codification system was developed. For the purpose of allotment of code numbers, all the existing general demand items were classified under 21 main groups with provision for further addition and expansion of the item categorised. The 21 main groups are given in Table 8.1.



**Table 8.1**  
**Classification of general demand items**

<b>Main group code number</b>	<b>Description of main group</b>
16	Tyres, tubes, flaps and retreading materials
17	Batteries
18	Oils and fuels
20	Machinery spares
22	Tools
24	Welding accessories
25	Foundry materials
26	Hardware ( Fasteners )
28	Metal and alloys
30	Aluminium Sheets and extruded sections
32	Fabricated bus body components
34	Rubber goods
35	Glasses
38	Paints, chemicals and painting and polishing materials
40	Timber and plywood
44	Pipe fittings
45	Electrical materials
47	Hardware ( general )
55	Textiles, rexins & uniforms
58	Fire fighting equipment
61	Miscellaneous ( general )

The first two digits of the code represent the main group of the item. Third and fourth digits represent the subgroup under the main group. Fifth and sixth digits represent the code number of the detailed group under the subgroup. Seventh, eighth and ninth digits represent code number indicating the serial order of the item.

#### Codification in other STUs

The Maharashtra SRIC uses a 10 digit code based on the Kodak system. The first nine digits constitute the basic code number and the 10th digit indicates computer check digit. The check digit is calculated by adopting "Modulus 11" method. Since the basic code consists of nine digits, the first digit at the extreme left is multiplied by nine, the second is multiplied by eight and so on, until the last digit is multiplied by one. The products are added, the sum is divided by 11 and the remainder is taken as the check digit.

The first two digits of the code represent the main group. Sixteen main groups ( 01 to 15 ) have been allotted to auto stores and 25 main groups ( 16 - 41 ) have been allotted for general stores. Third and fourth digits represent subgroup. Fifth digit represents detailed group in auto stores, whereas in general stores fifth and sixth digits represent detailed group. Seventh to ninth digits in general stores

represent basic material number of the item whereas in auto stores sixth and seventh digits indicate individual application ( model with wheel, base etc. ) and eighth and ninth indicate basic serial number of the item. Tenth digit is a check digit in both cases.

Delhi Transport Corporation uses an eight digit code, without any check digit and the same is also followed by the Rajasthan BRTC. Gujarat BRTC and Karnataka BRTC are following the six digit codification system which was originally introduced in the Bombay BRTC. BEST Undertaking uses a five digit code number, the first two digits representing the main group and the balance three digits denoting the ledger folio numbers. This system is reported to be working very well even for the computer applications. Most of the other undertakings use original equipment manufacturer's ( like Telco, Leyland, etc. ) part numbers for auto stores and own code numbers for general stores.

#### Analysis of the system in MBRTC

The above discussion indicates that in certain state transport undertakings they have evolved codification system covering both auto and general demand items. However, several other undertakings continue to follow manufacturer's

code for auto stores and separate own codes for general demand items as in MERTC.

The codification system in MERTC has several defects which include the following.

1. The codes for the different items are not consistent. Ten digit numerical codes are used for Tata parts and six digit alpha-numeral codes are used for Leyland parts. For Mico, Lucas TVS and Suniaram Clayton parts their own respective codes are followed and for the general demand items a nine digit code as explained earlier is followed. Hence there is no consistent system for all the items handled by the stores and this creates difficulties for the personnel handling it.
2. The codification system for the general demand items is not exhaustive. Many items were left out in the process of codification.
3. This was developed in 1975. Although several old items were discontinued and many new items have been added, the system has not been completely updated to reflect these changes.
4. The basis of codification or the significance of the various digits in the code is not known to the people

dealing with it. Hence the system has not become very popular and people generally find it difficult to memorise and use them wherever necessary.

5. The codification is based mainly on the functions of the materials rather than on their physical characteristics or chemical composition. This fails to bring together items of similar material and dimensions but performing different functions.

In order to rectify the defects indicated above, MBRTC must attempt to update the existing codification system in the immediate future. However, in the long run it must evolve a new system of codification covering all the stores items handled by it. This system should be as far as possible concise and flexible enough to accommodate new items. The groupings should be logical holding similar parts performing different functions, near to one another. MBRTC can greatly benefit from the practices and experiences in other STUs like Maharashtra SRTS, BESI Undertaking and Delhi Transport Corporation. A proper system of codification would facilitate identification of duplication and unnecessary variety of items, which in turn can lead to standardisation and simplification of stores.

### Control of Obsolete and Surplus materials

Obsolete materials are those which are no longer likely to be used in the undertaking due to many reasons such as changes in the designs and models of vehicles, changes in the specifications of materials and components, rationalisation of materials and so on. Obsolete items are not damaged materials. Surplus items are those materials which have no immediate use but have accumulated due to faulty planning, forecasting and purchasing.<sup>3</sup> However they have a usage value in future.

The important task for the Stores Officer regarding these materials, is that unless they are identified and disposed of in time, they keep in building up, occupying valuable storage space and wasting the time and effort of stores personnel. Besides blocking the capital, they also result in a lot of inefficiency in the functioning of stores. Hence it is crucial to identify and control these materials.

Analysis of the movement of items over a period of time can throw light on the materials likely to be obsolete. Stock issue cards should be examined and items which have not been consumed/issued for a period of one year, 2 years, 3 years, 5 years and above must be isolated. A list of such items

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3 P. Gopalakrishnan and M. Sundaresan, Op. cit. p.177.

and their value in terms of money and time must be made. This list should now be thoroughly examined with the technical and user department personnel to identify the obsolete items.

Another useful analysis can be conducted on the basis of the stock values of items. After the annual stock taking and valuation of the materials, they are arranged in a descending order according to their values. The cumulative totals are entered against each item. The descending number of the item is found as a percentage of the total number of items and the cumulative total value is found as a percentage of the grand total value in the stores for all the items. It will be found that in most cases about 10 per cent of the items contribute to about 70 per cent of the value that the next 20 per cent of the items account for about 20 per cent of the value and the remaining 70 per cent of the items contribute to the remaining 10 per cent of the value. The Stores Officer must concentrate on the top 10 per cent of the items which together account for 70 per cent of the value rather than on the bottom 70 per cent of items which account for only 10 per cent of the value. Along with this analysis if the number of months for which the existing stock would last is also determined and closely examined for all items, it would indicate the surplus items in stock.

Once the items have been identified as obsolete or surplus, the next step is to find methods for disposing them of. The possibility of reconditioning and salvaging the spareparts and other materials must be examined. Sometimes it will be possible to find alternate uses within the organisation or in other organisations. If so, this should be explored. The usual methods followed are to dispose them of by auction or by tender. In any case all the feasible alternatives must be examined before deciding on the method.

### Sample Study

Kardex stock cards of approximately 150 items of auto stores in the chief stores, KEHTC were carefully scrutinised to identify two categories of items, namely

- i. Items on stock, but without consumption
- ii. Items on record, but without stock and without consumption.

The scrutiny was conducted on 10 September 1990. Ten items each of the above categories were identified during the analysis. The first category of items, i.e. items on stock, but without consumption, are listed in Table 6.2 in order of their date of last issue.



**Table 8.2**  
**Items on Stock, but without consumption**  
**( as on 10th September 1980 )**

No	Item & code	No. of units on stock	Date of last issue
1	Insert Ring 601159	268	04.06.1976
2	Thrust washer 3123531152	22	14.12.1977
3	Dust cover 0004210887	724	29.03.1978
4	Hanger plate assembly Rear RH - 3214200247	6	25.05.1978
5	Grease retainer 3124131258	200	21.07.1978
6	Support front 0423130114 J	25	22.07.1978
7	Distributor seal 539069	24	09.08.1978
8	Thrust washer 3123531462	170	08.09.1978
9	Guard ring 3124231051	293	31.01.1979
10	Spacer ring 3223530852	27	07.03.1979

The table shows that items, last issued as far back as 4.6.1976, were still carried in Inventory. Out of the 10 items listed, as many as eight items had the last issue dates more than 2 years old. Although this is not strictly a random

sample, the study does reveal a high proportion of old and non-moving items in stock. Whether these items should be totally eliminated from the stock and stock records can be determined only after a careful examination of each item, with respect to its function, reasons for lack of demand, possibility of future requirement and possible alternate uses. Such critical analysis of slow moving and non-moving items would reveal obsolete and near obsolete items.

The second category of items, i.e. items on record, but without stock and without consumption, are listed in Table 8.3. They are also arranged in the order of the date of last issue.

**Table 8.3**  
Items on record but without consumption and without stock  
( as on 10th September 1980 )

Sl No	Item & code	Date of last issue
1	Pulley and damper 535557	08.11.1974
2	Engine cross member front 0423100026 J	19.10.1976
3	Spider 3233530049	02.04.1977
4	Oil pump compressor AL 8976	18.05.1977
5	Spicer ring 3223530152	18.06.1977
6	Pulley crank shaft 535526	02.12.1977

Table 8.3 ( contd.)

Sl No	Item & code	Date of last issue
7	Spring retainer 3124231189	30.09.1978
8	Hanger plate assembly rear LH 3214200317	31.10.1978
9	Water pump assembly 600836	15.11.78
10	Valve seat inlet 522127	28.03.1979

The table contains items with last issue dates as old as 8.11.1974. Out of the 10 items listed 6 items had the last issue dates more than 2 years old. This shows the continuance of stock records several years after the items ceased to be stocked and used. This results in wastage and unnecessary administrative effort, especially when these items are not likely to be stocked in future.

#### Stock review and control

The above sample study indicates the need for detecting the slow-moving, non-moving and surplus materials which result in excessive costs without contributing any corresponding service or utility. Such situations may arise due to several reasons, including changes in design or specifications, changes in models and 'makes', overbuying or over deliveries,

use of substitute materials and undetected errors in materials accounting or storage. These conditions rarely come to light of themselves particularly when several thousands of items are handled. Hence a comprehensive system of checking and detecting obsolete and surplus materials is required. This may include the following :

1. Periodic review of stock records on a systematic basis, taking a specified section each week or month so that the entire list is covered once or twice a year. Items which have not been demanded during the past six months or for which the rate of usage has dropped giving rise to excessive inventory levels, are noted and taken up for analysis and action.
2. Analysis of physical inventory at the time of annual stock verification. Analysis on the basis of the stock value and movement of items or in terms of the number of months consumption will indicate 'problem cases' for further scrutiny. Appropriate standards must be set up to indicate the basis upon which an item should be declared obsolete or surplus.
3. Periodic "clean-up" campaigns, covering the entire Materials Management organisation, including the depot and workshop stores. This provides for review of materials that

have been issued from stores but have not been used for the anticipated purpose, those held in workshops, subsidiary stock rooms and toolcribs and thus outside normal stores supervision.

If there is no reason for holding such items against some future contingency, they must be disposed of and their stock records must be closed or deleted. This will ensure reduced investment in stores, a clean inventory, up-to-date stock records, and increased stock turnover by elimination of inactive items.

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**CHAPTER - X**  
**CONCLUSIONS AND RECOMMENDATIONS**

This study has made an in-depth analysis of the materials management organisation, systems and practices in KSRTC. The materials management practices in other similar undertakings have also been reviewed and compared. In particular, four undertakings, besides the Kerala State Road Transport Corporation, viz., Karnataka SRTC, Andhra Pradesh SRTC, Gujarat SRTC and Maharashtra SRTC were chosen for detailed analysis and comparison. A statistical analysis using certain key performance indicators of materials management was attempted for KSRTC and for the other selected undertakings. The analysis covered 14 year period from 1965-66 to 1978-79 in respect of KSRTC and six year period from 1974-75 to 1979-80 for comparison among the sample undertakings. The consumption pattern, stock levels, stock movement, reordering and reviewing policies, lead time and other aspects of materials management in KSRTC were critically examined using the data pertaining to a few selected items.

Data regarding KSRTC was collected through detailed personal discussions and analysis of files and records at the Central Office, Chief Stores and Regional Chief Stores. The Annual Administration Reports of the Corporation gave a lot of useful statistical information. Data regarding other undertakings was collected through a mailed questionnaire

survey, covering all the undertakings in the country. This was supplemented by analysis of published materials such as Annual Administration Reports of the undertakings, and statistical publications of the Ministry of Shipping and Transport, Government of India and the Association of State Road Transport Undertakings. Seminar proceedings of the Central Institute of Road Transport, Poona, also provided valuable information on the systems and practices.

A statistical analysis of the Stores consumption and inventory holdings using the various indicators such as stores consumption per bus and per kilometre, inventory holdings per bus and per lakh kilometres and inventory for number of months consumption, showed unusually high levels of stores consumption and low levels of inventory in KSRTC, in comparison with other similar undertakings. Further analysis established a strong positive relationship between the inventory holdings and the quality of transport services provided by KSRTC. This implied that the low inventory levels and high stockout rates might have resulted in reduced availability of vehicles for operation. Besides lowering the quality of service, this might have caused loss of revenue to the Corporation thus increasing the overall losses. The unusually low inventory levels also implied



uneconomic inventory decisions resulting in unnecessary costs. It may, perhaps, be possible to reverse the trend of ever increasing losses in KSRTC by overhauling the existing organisational set-up and by establishing scientific methods and systems for planning, purchasing, storing and controlling materials. Hence these areas in KSRTC were critically examined and compared with other similar undertakings to identify weaknesses and to suggest methods of improving the performance of materials management function.

The major conclusions and recommendations can be summarised under five areas, namely organisational set-up, materials planning, purchasing, store-keeping and inventory control.

## **I Organisational Set-up**

The organisation structure of any enterprise influences, to a great extent, the manner in which various individuals and groups of people work together and channel their efforts towards a common goal. The overall structure of a state transport undertaking largely determines the environment and the setting in which the materials management department has to function. Hence, in the first instance, the evolution and the existing pattern of the overall set-up in KSRTC was examined and compared with other undertakings. Thereafter

the materials management structures in various STUs were analysed to bring out their salient features.

Examination of the overall set-up in KBRTC indicated: the need for strengthening the general administrative structure on geographical basis. Inadequate delegation of authority to the depot/sub-depot level was also noticed. Coordination among the three primary functions of traffic, maintenance and purchase/stores was found to be difficult in the existing structure.

Analysis of the materials management organisation also showed the need for greater delegation of authority in respect of purchase and stores decisions. A strong and decentralised purchase and stores set-up may reduce handling and transportation costs of materials, delays in replenishing stock at sub-stores and emergency purchases, thereby improving the overall efficiency of materials management.

The following are some of the major suggestions for revitalising the organisational set-up.

1. The general administrative set-up may adopt a three tier structure consisting of depots, divisions and a central office at the headquarters.

2. The Depots could be the basic operating units. The Depot Manager may be the executive head of a depot. He may be assisted by staff members in the traffic, mechanical engineering, stores, accounts and statistical sections. He would report to the Divisional Manager.

3. Depots may be classified into A, B or C categories depending upon the number of schedules and/or the number of vehicles allotted. The facilities and staffing pattern may be varied for the different categories of depots.

4. The depots may be grouped into divisions for more effective administrative control, coordination and supervision. The existing districts and sub-districts in KSRTC may be grouped into three or four divisions.

5. A division would be headed by a Divisional Manager who reports to the Deputy General Manager of the central office. The Divisional Manager would be assisted by officers in traffic, engineering, purchase and stores, accounts, labour welfare and statistics.

6. There will be greater decentralisation of authority for decision making at the divisional level. Most of the routine administrative functions will be performed at the depot and divisional levels. The central office will be

responsible for the overall supervision and control, broad policies and long term objectives and plans of the enterprise.

7. The Controller of Purchase and Stores may report directly to the General Manager, alongwith the heads of mechanical engineering and traffic functions.

8. The Controller of Purchase and Stores may be assisted by one Assistant Controller ( Purchase ) and one Assistant Controller ( materials management services ) at the head office. The Stores Officer ( central stores ) will also report directly to him.

9. The head office may arrange for the purchase of all A and B category items required by the Corporation. The Assistant Controller ( Purchase ) may pool the requirements of the divisions for these materials, based on their indents and may arrange to supply the materials directly to the divisional stores from the vendors. The purchase of C category items required by the divisions may be made by the Assistant Controller ( Purchase & Stores ) at the divisions.

10. The central store at the headquarters may stock only imported materials, critical items and other selected items with high unit cost and low demand. The sub-stores attached

to the operating units and workshops may obtain supplies of imported materials and items with high unit cost and low demand from the central store. Other materials would be supplied from the divisional store on the basis of monthly intents.

11. The Assistant Controller ( materials management services ) may be placed in a staff position to the Controller of Purchase and Stores. He may undertake value analysis studies and codification, standardisation and simplification of items and other similar exercises for reducing the cost and improving the performance of materials management function. He may also develop and help to implement suitable systems of inventory control for the Corporation.

## II Materials Planning

Materials planning involves determining, scientifically, the quantities and time schedule of material requirements for meeting production, maintenance and operational needs. Analysis of the practices in selected undertakings showed significant differences in materials planning systems and procedures followed by various state transport undertakings in the country. Procedures for materials planning were

found to be laid down in most of the large undertakings. But in some undertakings, particularly in the smaller sized transport undertakings there is no system of planning and budgeting the material requirements on a periodical basis. In such undertakings, materials are often bought as and when needed.

Large undertakings generally estimated the requirements of materials at regional or divisional levels and later consolidated them at the central office. In smaller undertakings materials forecast for the entire organisation was often prepared at the central office itself.

The state transport undertakings by and large use relatively crude and simple methods for estimating material requirements. One method which was found to be used by several undertakings was the simple arithmetic average of the past consumption. The other methods like Moving Average and Exponential Smoothing which are often considered to be better than simple average method have not been used by any state transport undertaking.

A comparative study of three selected forecasting methods viz., Exponential Smoothing, Last Period Forecast and Average Past Consumption method was conducted using the

actual past data of four stores items from KESTC. Different forecasts were simulated using the past data and forecast errors were computed in each case. Analysis of the forecast errors showed that Exponential Smoothing method with a suitable value of the Smoothing Constant, produced reasonably good forecasts for all the sample items studied.

The following suggestions are made for KESTC on the basis of the comparative study and analysis of materials planning practices in STUs.

1. Clearcut procedures must be laid down by the Corporation for planning and budgeting the material requirements on yearly basis.
2. In the proposed decentralised organisational set-up, forecasts for various divisions may be prepared independently at the divisional levels and then they could be consolidated at the central office.
3. The central workshop may estimate the requirements of materials for the anticipated body building and other production and fabrication works using bill of materials and norms of consumption.

4. Sub-stores attached to the operating units and workshops may also determine their material requirements in advance so as to enable proper stocking and supply of materials.

5. Accuracy of material forecasts may be improved by adopting Exponential Smoothing method. This method may be used for all high value items. A tracking signal may also be set so that monitoring and control of the forecasting system will be facilitated.

### III Purchasing

Purchasing is one of the key functions of materials management. Since purchasing accounts for a major share of the total expenditure in STUs, proper planning, execution and control of the purchasing function may result in significant amount of savings for the enterprise.

Review of the purchasing practices in various state transport undertakings showed that purchasing is mostly centralised at the head office except in very large undertakings like Maharashtra SRTC and Andhra Pradesh SRTC. In these undertakings purchasing is undertaken at both central and regional levels as well based on clear demarcation of responsibilities for each.



State transport undertakings, by and large, procure proprietary items like Tata spares and Leyland spares from chassis suppliers or from original equipment manufacturers. Other items are purchased by inviting tenders or from the rate-contracted suppliers of the Association of State Road Transport Undertakings. The KSRTC was found to follow the store purchase procedure of the State Government.

A proper system of evaluating the performance of suppliers would enable the organisation to retain and develop good suppliers, thus ensuring reliable sources of supply at competitive rates. However it was observed that most of the undertakings did not have any formal systems or procedures for evaluating supplier performance.

Analysis of the delegation of purchase authority in different undertakings showed wide variations in the practices and in the extent of authority delegated to various levels in the organisation. One practice widely followed among state transport undertakings is to constitute purchase committees at different levels and delegate authority to these committees rather than to individual managerial positions. The study revealed that the purchase authority delegated to the operating units in KSRTC is inadequate when compared to other similar undertakings.

Some of the suggestions for improving the purchase systems and procedures in KSRIC are as follows.

1. KSRIC may use annual contract system for selected major items ( considering ABC classification and other relevant factors ). The contract may be made slightly flexible by incorporating a  $\pm 25\%$  quantity clause. Order upto 75 % of the estimated annual requirement may be placed at the first instance, the balance can be ordered subsequently depending upon requirements. This method has the advantage of reduced purchase order costs and bulk order discounts.
2. Suppliers may be asked to deliver the materials directly to the divisional and central stores. Specific delivery schedule may also be given as per the anticipated requirements. Since the deliveries are staggered and supplies are made directly to the central and divisional stores, distribution costs would <sup>be</sup> significantly reduced.
3. KSRIC may evolve formal systems of rating the performance of major suppliers and use them for negotiation and future source selection purposes. Development of new sources and ancillary units must also be undertaken more vigorously.

4. Analytical techniques, particularly value analysis, may be used in body building, major repair and fabrication works and in the purchase of non-proprietary and multi-source items. Network techniques may be advantageously employed in some of the major production and fabrication works and in body building programmes.

5. The adequacy of the existing levels of purchase authority delegation must be examined. It would perhaps be desirable to enhance the monetary limits for emergency purchase fixed for the District Transport Officers in the Corporation.

6. Rather than following the store purchase manual of the state government, KSRTC must prepare a separate purchase manual for its purpose. It must clearly lay down suitable policies and procedures for purchase, emphasising the overall performance and results rather than rigid rules and formalities. This is necessary for an organisation like KSRTC which is expected to be run on business principles, providing efficient and economic service in a competitive environment.

#### IV Store-keeping

Store-keeping function is primarily responsible for the physical control over inventories and for providing a balanced

flow of materials to meet the requirements of the engineering and operations departments in state transport undertakings. The most economical levels of this service must be determined, considering all the relevant factors and a suitable organisational set up must be developed to provide that service.

Analysis of the organisation and practices in various undertakings showed that the set up of stores in most of the undertakings follows a hierarchic structure with one central or regional store supplying materials to several sub-stores spread over a region. Quite often it is either a three tier structure or a two tier structure, although there are one or two undertakings with a single tier structure. In a three tier set up, the organisation consists of depot stores, divisional stores and central stores. This is generally followed by the mofussil or district transport undertakings. Under the two tier set up there are two different patterns. In the first category, the organisation consists of central stores and depot stores only. This is mostly followed by city transport undertakings and small district transport undertakings and small district transport undertakings. In the second category of two tier set up, there are only divisional/regional stores and depot stores. The central store either does not exist or if it does, it stocks certain

critical and high value items only. This pattern is adopted by certain large district transport undertakings like Andhra Pradesh SRTC and Gujarat SRTC.

In KERTC, the sub-stores in the northern region obtain supplies from the Regional Chief Store, Alwayse while the sub-stores in the northern region get replenishment directly from the Chief Store, Trivandrum. Hence it follows a two tier set up in the southern region and a three tier set up in the northern region.

A review of the systems of codification followed by the state transport undertakings indicated that certain undertakings have evolved their own codification systems covering both auto stores and general demand items. However most of the undertakings continue to use manufacturer's codes for autostores. In KERTC also there is no uniform method of codification for all stores items. For proprietary items like Tata spares, Leyland spares and Mico parts the manufacturer's codes are used while for general demand items a separate 9 digit code is used.

Scrutiny of Kardex stock cards in KERTC revealed the presence of large number of non-moving and surplus materials in stock which would result in excessive costs without any corresponding service or utility to the organisation. The

study also showed wastages due to maintenance of unnecessary stock records relating to items which were discontinued several years back.

In the light of the above findings, the following suggestions are made to streamline the stores set up and systems in K&MTC.

1. The stores set up may follow a three tier structure with one central store, three or four divisional stores and sub-stores attached to all operating units and workshops.
2. The K&MTC may update the existing codification system by incorporating the new items and deleting the items that were discontinued. It would be desirable to evolve a new system of codification which can ensure uniform codes for all the stores items handled by the Corporation. The system must be based on logical grouping of items and must be simple and concise so that people can use it without much difficulty.
3. Standardisation and simplification of stores may also be undertaken so that duplication and unnecessary variety among the stores items can be reduced.
4. Stores personnel may periodically scrutinise the stock records to identify slow moving, non-moving and surplus

APPENDIX

Appendix - IFleet strength of Nationalised Road Transport Undertakings as on 31st March 1981

<b>Sl No</b>	<b>Name of the Undertaking</b>	<b>Passenger buses</b>	<b>Goods Carriages</b>	<b>Other Vehicles</b>	<b>Total fleet</b>
1	Maharashtra SRTC	10066	-	294	10360
2	Andhra Pradesh SRTC	7287	-	552	7839
3	Gujarat SRTC	6678	-	316	6994
4	Uttar Pradesh SRTC	5853	147	33	6033
5	Karnataka SRTC	5164	-	259	5423
6	Kerala SRTC	3152	-	141	3293
7	Delhi TC	2754	-	176	2930
8	Madhya Pradesh SRTC	2463	181	51	2695
9	Haryana ST	2421	-	41	2462
10	Rajasthan SRTC	2345	-	55	2400
11	BEST Undertaking	2049	136	128	2313
12	Punjab ST	2248	-	-	2248
13	Bihar SRTC	1751	-	91	1842
14	Palleyan TGL(Metro)	1794	-	34	1828
15	Jammu & Kashmir RTC	979	635	41	1473
16	Calcutta STC	1079	-	-	1079
17	Pandiyan RWCL	1045	-	33	1078
18	Cheran TGL	963	-	75	1038



## Appendix - I (contd.)

Sl No	Name of the Undertaking	Passenger buses	Goods Carriages	Other Vehicles	Total fleet
19	Ropon RTC	930	10	25	965
20	Himachal Pradesh RTC	839	31	42	912
21	Cholan RWCL	764	29	12	805
22	Assam STC	772	20	-	792
23	Orissa SRTC	776	-	2	778
24	Kattabomman TGL	678	-	31	709
25	Ahmedabad MTS	610	-	14	624
26	Anna TGL	512	16	12	540
27	Pallavan TGL(Dist.)	502	-	37	539
28	Thiruvalluvar TGL	458	-	46	504
29	North Bengal STC	373	66	20	459
30	Pune MT	365	-	21	386
31	Thanthal Periyar TGL	335	-	16	351 <sup>0</sup>
32	Orissa RTCL	313	-	2	315
33	ITDC	67	-	221	288
34	Tripura RTC	142	75	5	222
35	Sikkim MT	69	125	17	211
36	Chandigarh TU	177	1	1	179
37	Orissa SOTCL	-	172	-	172
38	Durgapur STC	151	-	19	170
39	Bombay Metropolitan TGL	165	-	3	168

## Appendix - I ( contd.)

Sl No	Name of the Undertaking	Passenger buses	Goods Carriages	Other Vehicles	Total fleet
40	Manipur SRTC	106	38	11	155
41	Nagaland ST	121	19	3	143
42	Meghalaya STC	69	27	-	96
43	Mizoram TD	67	20	2	89
44	Kolhapur MTU	70	-	3	73
45	Tamil Nadu Goods TCL	-	71	-	71
46	Pirpri Chinchwad MTU	65	-	-	65
47	Sholapur MTU	64	-	-	64
48	Municipal Corporation Transport, Ludhiana	40	-	-	40
49	Jamnagar MTS	26	-	-	26
50	Kadamba TCL	15	-	-	15
<b>Total</b>		<b>69550</b>	<b>1819</b>	<b>2885</b>	<b>74254</b>

\* As on 31st March 1980

Source : Association of State Road Transport Undertakings, Report on the Performance of Nationalized Road Transport Undertakings 1979-80 and 1980-81. CIRT. Pune.

**Appendix -II**  
**Type of Undertaking**

**A. Corporations**

- 1 Andhra Pradesh State Road Transport Corporation
- 2 Bihar State Road Transport Corporation
- 3 Calcutta State Transport Corporation
- 4 Delhi Transport Corporation
- 5 Durgapur State Transport Corporation
- 6 Gujarat State Road Transport Corporation
- 7 India Tourism Development Corporation
- 8 Karnataka State Road Transport Corporation
- 9 Kerala State Road Transport Corporation
- 10 Madhya Pradesh State Road Transport Corporation
- 11 Maharashtra State Road Transport Corporation
- 12 North Bengal State Transport Corporation
- 13 Orissa State Road Transport Corporation
- 14 Pepsu Road Transport Corporation
- 15 Rajasthan State Road Transport Corporation
- 16 Uttar Pradesh State Road Transport Corporation
- 17 Assam State Transport Corporation
- 18 Himachal Road Transport Corporation
- 19 Jammu & Kashmir Road Transport Corporation
- 20 Meghalaya Transport Corporation

**Appendix - II ( conti. )**

- 21 Manipur State Road Transport Corporation
- 22 Tripura Road Transport Corporation

**B. Companies**

- 1. Anna Transport Company Limited
- 2 Cheras Transport Company Limited
- 3 Cholan Road Ways Company Limited
- 4 Kattabomman Transport Company Limited
- 5 Pallavan Transport Company Limited
  - (1) Metropolitan
  - (11) District
- 6 Pandiyan Road Ways Company Limited
- 7 Thanthai Periyar Transport Company Limited
- 8 Thiruvalluvar Transport Company Limited
- 9 Bombay Metropolitan Transport Company Limited
- 10 Orissa Road Transport Company Limited
- 11 Kadamba Transport Company Limited
- 12 Orissa State Goods Transport Company Limited
- 13 Tamil Nadu Goods Transport Company Limited

**C. Government Undertakings**

- 1 Haryana State Transport
- 2 Punjab State Transport
- 3 Chandigarh Transport Undertaking

**Appendix - II ( contd. )**

- 4 Nagaland State Transport
- 5 Sikkim National Transport
- 6 Transport Dept., Govt. of Nigeria
  
- D. Municipal Undertakings
  
- 1 Ahmedabad Municipal Transport Service
- 2 B&T Undertaking
- 3 Pune Municipal Transport
- 4 Pimpri - Chinchwad Municipal Transport
- 5 Kolhapur Municipal Transport
- 6 Shelapur Municipal Transport
- 7 Amritsar High Transport
- 8 Jannagar Municipal Transport
- 9 Municipal Transport, Ludhiana

**Source : Association of State Road Transport Undertakings,  
Report on the Performance of Nationalised Road  
Transport Undertakings, 1979-80 and 1980-81.**

## Appendix - III

A Study on Materials Management Practices  
in State Transport Undertakings in India

Name of the Undertaking

Name and Designation of  
the respondent

1. i) Do the activities of purchasing, storekeeping, inventory control and other related functions form a single department under one manager/ controller in your undertaking? Yes/No
- ii) If 'yes' (form a single department), please give the following details.
- (a) Year in which this organisational form was adopted \_\_\_\_\_
- (b) Present designation of this department head \_\_\_\_\_
- (c) To whom does he report in the organisation \_\_\_\_\_
- (d) Which are the sections under this department ( list the designation of the officers directly reporting to the department head )
- iii) If 'No' ( do not form a single department ) to whom are the heads of the following functions report in your organisation ?
- Reporting to :
- (a) Materials Planning \_\_\_\_\_
- (b) Purchase \_\_\_\_\_
- (c) Stores \_\_\_\_\_
- Note : Kindly attach a sketch of your organisational set-up indicating the reporting relationships of all the senior and middle level managers.

## Appendix - III (contd.)

- (d) Inventory control \_\_\_\_\_
- (e) Receiving \_\_\_\_\_
- (f) Quality control  
( incoming materials ) \_\_\_\_\_
- (g) Materials Handling and  
transportation \_\_\_\_\_

2. Please give the approximate age-break-up of your fleet  
( buses ) as on 31st March 1960.

Below 10 years \_\_\_\_\_

10 years & above \_\_\_\_\_

Total fleet (buses) \_\_\_\_\_

3. Approximate value of all purchases ( spareparts, fuel,  
tyres, batteries, stationery, etc., excluding capital  
equipments) during the financial year ending 31st  
March 1960.

Rs. \_\_\_\_\_

4. Please indicate the monetary limits fixed for sanctioning  
purchase ( extent of delegation ) in the following cases:

a) Depot level Rs.

b) Controller of Purchase Rs.

c) General Manager Rs.

d) Chairman/Managing Director Rs.

e) Purchase Committee, if  
applicable Rs.

5. Under what circumstances or for which category of items do  
you generally adopt the following purchase methods ?

Circumstances/item category

a) Tender system

- Single \_\_\_\_\_
- Limited \_\_\_\_\_
- Open \_\_\_\_\_

## Appendix - III ( contd ).

- b) Rate contracts \_\_\_\_\_  
 c) Sub-contracts \_\_\_\_\_  
 d) Local cash purchase \_\_\_\_\_  
 e) Others, please specify \_\_\_\_\_
6. Please indicate the approximate percentage share of your annual purchase made from the following suppliers :
- Percentage share**
- a) Suppliers registered with ASRTU standing committee \_\_\_\_\_  
 b) Suppliers registered with DCS & D \_\_\_\_\_  
 c) Suppliers registered with your undertaking \_\_\_\_\_  
 d) Others \_\_\_\_\_
7. i) Do you evaluate/rate the performance of your suppliers periodically ? Yes/No
- ii) If yes, briefly indicate the method/s used by you for evaluating their performance.
8. i) Do you use any imported materials ( spares, lubricants, raw materials, supplies etc. ) Yes/No
- ii) If 'yes' approximate number of items imported in 1979-80 \_\_\_\_\_  
 Approximate value of the above in Rs. \_\_\_\_\_
9. i) Have you conducted value analysis for any of the items in your undertaking ? Yes/No
- ii) If 'yes', please name a few of these items.
- iii) What was the extent of savings made/annum as a result of the analysis ? Rs. \_\_\_\_\_
10. Please indicate the number of stores in your undertaking
- Number**
- a) Central Stores \_\_\_\_\_  
 b) Divisional/Regional Stores \_\_\_\_\_  
 c) Depot Stores \_\_\_\_\_  
 d) Workshop Stores \_\_\_\_\_  
 e) Others, please specify \_\_\_\_\_



## Appendix - III ( contd. )

11. i) Approximate number of items stocked in  
 a) Central Stores \_\_\_\_\_  
 b) Depot Stores \_\_\_\_\_
- ii) Approximate total value of inventory stock as on 31st March 1980 Rs. \_\_\_\_\_

12. i) Do you use any codes for identifying the large number of items in your stores ? Yes/No
- ii) If 'Yes' please indicate the codes used

Item category	Whether TELCO, Leyland or own code	Briefly indicate the code for any one item
Auto Stores		
General Stores		

- iii) If 'No' please explain how you identify the items in the stores.

13. i) Do you forecast/estimate the requirement of items for future period ( say next year, next quarter, etc. ) Yes/No
- ii) If 'yes' what methods do you use for forecasting the requirements ?

14. How do you determine the purchase order quantity (order size ) for the different category of items ?

<u>Item categories</u>	<u>Method of determining order size</u>
------------------------	---

15. i) Do you follow Economic Order Quantity ( EOQ ) for purchasing any of the items ? Yes/No
- ii) If 'yes' please indicate the category of items purchased on EOQ basis.
- iii) If 'No' please indicate the reasons for not ordering on EOQ basis.

## Appendix - III ( contd.) .

16. What inventory control system do you follow in your undertaking for the different category of items ?

Item categories

- a) Fixed order quantity system or Two Bin System (where order is placed when the stock level reaches reorder level and the order size is fixed).
- b) Fixed order Interval System (where stock levels are reviewed at fixed intervals and orders are placed )
- c) Others, please specify

17. i) Have you conducted ABC Analysis of Stores items? Yes/No

ii) If 'Yes' what was the basis of the analysis ?

- a) Unit price \_\_\_\_\_
- b) Annual Consumption value \_\_\_\_\_
- c) Movement (Usage) of items \_\_\_\_\_
- d) Availability of items for procurement \_\_\_\_\_
- e) Others, please specify

iii) Please indicate stock levels generally maintained for these categories of items .

Maximum level Reorder level Safety stock

- A Category
- B Category
- C Category

18. Please indicate how many months of stock you generally keep for the following :

Maximum Reorder Safety  
level level Stock

- i) Imported items
- ii) Indigenous items
  - a) Locally available
  - b) Others

## Appendix - III ( contd: )

19. What method do you follow for pricing/valuing material stocks and issues ?
- a. First in, First out \_\_\_\_\_ b. Last in First out \_\_\_\_\_  
 (FIFO) (LIFO)
- c. Weighted average method ( Issue price is calculated on a weighted average basis whenever fresh stocks are received ) \_\_\_\_\_
- d. Others, please specify.
20. Have you conducted any of the following analysis for inventory items in your undertaking ?
- a) VED Analysis(Vital,Essential,Desirable) Yes/No
- b) MNO Analysis(Moving,Non-moving,Ghost) Yes/No
- c) FBN Analysis(Fastmoving,slowmoving,Nonmoving) Yes/No
- d) HML Analysis(High Value,Medium Value,Low Value) Yes/No
- e) SDE Analysis ( Scarce, Difficult to procure, Easily available ) Yes/No
21. Do you use any of the following aids for purchase, stores or inventory control purposes ?
- a) Kardex System Yes/No
- b) Kalamazoo files Yes/No
- c) Unit Recording Machine Yes/No  
Owned/Hired
- d) Electronic Computer Yes/No  
Owned/Hired
- e) Other similar aids, please specify.

Appendix - IV  
Kerala State Road Transport Corporation - Some Key Statistics

Sl No	Particulars	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72
1	Total fleet strength as on 31 March	921	1006	1109	1304	1446	1561	1695
2	Average number of vehicles held	805	854	951	1114	1301	1419	1510
3	Fleet utilisation percentage	89.3	91.0	91.4	89.8	88.6	86.7	83.2
4	Total effective kilometres operated ( lakh )	633.2	700.7	791.8	899.1	1038.6	1047.4	1106.3
5	Vehicle utilisation kms/vehicle/day	238	244	245	245	248	233	241
6	Total number of passengers carried ( lakhs )	1585.3	1891.6	2210.6	2555.9	2927.4	3106.4	3146.6
7	Total revenue (Rs. Lakhs.)	631	742	888	1018	1167	1225	1384
8	Capital Investment (Rs. Lakhs)	572	622	677	844	1015	1164	1385
9	Total staff employed	6862	7415	8733	10160	11938	12371	13615
10	No. of schedules operated	697	768	962	1101	1205	1257	1381
11	Breakdown/10,000 kms	1.1	1.0	1.3	1.5	2.0	2.1	2.5
12	Accident/lakh kms.	2.5	2.2	2.7	2.8	2.5	2.4	2.7
13	Age of vehicles							
	(I) Below 5 years	424	437	412	569	690	774	818
	(II) 5-10 years	362	389	445	410	417	419	437
	(III) 10 years and above	135	180	252	325	339	368	440

Source : (I) KERTC, Annual Administration Reports, various years.

(II) Statistical Section, KERTC, Trivandrum.

Appendix 4 IV ( contd. )

Sl No	Particulars	1972-73	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79
1	Total fleet strength as on 31st March	1874	1956	2110	2244	2480	2620	2822
2	Average number of vehicles held	1610	1751	1887	2049	2284	2481	2582
3	Fleet utilisation - percentage	84.1	83.5	83.2	83.8	86.3	84.0	83.9
4	Total effective kilometres operated ( lakhs )	1207.2	1345.2	1550.9	1782.9	2028.6	2050.0	2127.7
5	Vehicle utilisation kms/vehicle/day	244	252	271	284	282	271	269
6	Total number of passengers carried ( lakhs )	3325.6	3513.5	4216.8	5183.4	5111.4	5556.5	6328.5
7	Total revenue (Rs. in lakhs)	1598	1878	2492	3091	4042	4327	4737
8	Capital investment (Rs. lakhs)	1572	1855	2087	2289	2686	3029	3559
9	Total staff employed	N.A.	17580	19335	20805	21791	23264	27751
10	No. of schedules operated	1534	1596	1726	1856	2195	2305	2446
11	Breakdown/10,000 kms	2.2	2.2	2.3	2.4	1.7	1.8	2.8
12	Accident/lakh kms	2.4	2.2	2.3	2.5	2.2	2.4	2.7
13	Age of vehicles							
	(I) Below 5 years	973	944	993	1017	1118	1009	1089
	(II) 5 - 10 years	411	571	561	768	815	970	942
	(III) 10 years & above	490	441	456	459	546	641	791

Appendix - V

Comparable statistics for five selected undertakings

Sl No	Criteria	GIU	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80
1	Average number of vehicles held	Kerala	1887	2048	2284	2481	2582	2748
		Karnataka	3120	3782	4338	4576	4395	4428
		Andhra Pradesh	3225	3898	4201	4844	5273	5557
		Gujarat	5466	5286	5201	5331	5702	6101
		Maharashtra	7376	7600	7785	8259	8151	8765
2	Capital Investment (Rs. Lakhs)	Kerala	2102.56	2380.81	2759.53	3028.10	3559.33	3988.06
		Karnataka	4342.54	5195.42	5998.85	6338.15	6892.90	7806.88
		Andhra Pradesh	4318.62	5805.48	7304.58	8495.58	10614.38	12635.08
		Gujarat	5370.55	6019.07	6901.19	7950.04	9650.57	11292.09
		Maharashtra	7735.49	8753.00	10162.27	11448.00	14169.32	16541.82
3	Cost Per-ton (paise per km.)	Kerala	85.40	83.53	72.00	86.41	89.40	120.20
		Karnataka	58.16	61.02	59.25	69.70	13.31	76.78
		Andhra Pradesh	46.84	49.08	57.93	66.29	74.43	71.50
		Gujarat	52.64	56.18	63.77	70.24	69.86	71.07
		Maharashtra	67.15	65.81	61.62	74.33	75.30	80.49

## Appendix - V (contd.)

Sl No	Criteria	SIU	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80
4	Cost - fuel and labrli- cants (paise/km)	Kerala Karnataka Andhra Pradesh Gujarat Maharashtra	37.10	40.06	42.00	43.05	45.10	49.20
			35.71	38.73	41.13	41.21	42.62	47.21
			33.28	37.01	37.36	37.17	38.90	43.26
			30.77	33.46	35.72	35.09	35.05	37.76
			34.46	38.63	40.28	37.78	37.36	41.81
5	Cost - tyres & tubes (paise/km)	Kerala Karnataka Andhra Pradesh Gujarat Maharashtra	15.70	21.00	20.00	20.94	22.00	23.00
			19.66	22.40	20.41	21.35	24.65	27.39
			14.93	19.70	16.67	17.00	23.23	26.50
			15.96	17.55	15.28	13.54	15.48	19.08
			21.07	22.00	20.62	20.14	24.33	27.20
6	Cost - spare parts (paise/km)	Kerala Karnataka Andhra Pradesh Gujarat Maharashtra	7.90	10.00	13.00	13.75	15.20	15.90
			6.61	7.74	6.98	6.85	8.22	9.53
			13.79	15.07	14.95	14.07	15.18	18.13
			8.93	9.70	8.35	9.01	9.46	8.89
			8.31	10.46	9.60	10.52	14.27	13.56
7	Cost - other materials (paise/km)	Kerala Karnataka Andhra Pradesh Gujarat Maharashtra	6.50	4.30	3.00	5.00	3.20	4.10
			10.68	11.09	3.37	1.83	0.87	16.00
			3.75	4.77	5.06	3.62	2.74	4.72
			5.67	8.08	7.82	7.12	6.49	5.81
			14.78	16.67	15.44	14.88	8.03	12.78
8	Total Material cost(4 to 7) items (paise/km)	Kerala Karnataka Andhra Pradesh Gujarat Maharashtra	67.20	75.36	78.00	82.75	86.50	92.20
			72.66	79.96	71.89	71.24	75.36	100.13
			65.75	76.55	74.04	71.86	81.05	90.61
			63.33	68.79	67.17	64.76	66.48	71.54
			78.62	87.76	86.94	83.32	83.99	95.35

Appendix - V (contd.)

Sl No	Criteria	STU	1974-75	1975-76	1986-77	1977-78	1978-79	1979-80
9	Total operating cost(3-7) items (paise/km) Maharashtra	Kerala	152.60	158.89	150.00	169.16	175.90	212.40
		Karnataka	130.82	140.98	131.14	140.94	149.57	176.91
		Andhra Pradesh	112.59	125.63	131.97	138.15	155.48	162.11
		Gujarat	115.97	124.97	130.94	135.00	136.34	142.61
		Maharashtra	145.77	153.57	148.56	157.65	159.29	175.84
10	Cost - taxes (paise/km) Maharashtra	Kerala	15.90	13.78	27.00	30.50	30.00	30.00
		Karnataka	22.51	25.32	27.81	28.82	27.98	46.09
		Andhra Pradesh	27.81	29.95	31.82	31.78	35.98	37.81
		Gujarat	45.54	50.18	53.66	54.95	56.65	58.88
		Maharashtra	47.29	49.47	49.09	46.90	48.25	49.43
11	Cost - Depreciation (paise/km) Maharashtra	Kerala	11.60	10.87	11.00	12.40	13.00	14.90
		Karnataka	15.15	17.16	19.25	20.92	21.08	22.84
		Andhra Pradesh	20.55	20.54	20.72	22.23	24.62	26.77
		Gujarat	17.19	18.19	20.40	22.32	24.49	26.74
		Maharashtra	14.57	16.12	17.68	19.99	29.85	32.18
12	Cost - Interest (paise/km) Maharashtra	Kerala	6.00	5.82	7.00	5.90	6.60	7.50
		Karnataka	7.02	7.29	7.71	8.27	8.91	8.45
		Andhra Pradesh	2.89	3.34	4.86	3.33	5.54	7.71
		Gujarat	5.33	5.70	6.62	7.19	8.58	9.06
		Maharashtra	5.59	8.43	8.13	6.85	5.86	5.38
13	Cost others (paise/km) Maharashtra	Kerala	4.50	6.35	10.00	7.01	14.10	9.30
		Karnataka	9.12	10.02	19.58	23.77	27.36	12.04
		Andhra Pradesh	6.89	11.29	10.79	13.39	11.85	13.85
		Gujarat	9.70	11.17	11.40	12.53	11.53	12.01
		Maharashtra	7.25	7.65	8.74	10.87	11.24	12.22



Appendix - V (contd.)

Sl No	Criteria	SIU	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80
14	Total Cost Pa/km. (3-13) Utilization %	Kerala	190.60	195.70	205.00	224.97	239.60	273.70
		Karnataka	184.62	201.77	205.49	222.72	235.00	266.33
		Andhra Pradesh	170.65	190.75	200.16	208.88	233.66	248.25
		Gujarat	193.73	210.21	223.02	231.99	237.59	249.30
		Maharashtra	220.47	235.33	230.20	242.26	254.49	275.05
15	Total Revenue Pa/km	Kerala	150.40	172.94	199.20	210.00	222.64	234.80
		Karnataka	185.08	196.66	206.85	216.97	233.05	262.27
		Andhra Pradesh	184.05	196.91	205.98	206.40	220.14	232.60
		Gujarat	178.93	202.91	217.55	223.58	229.57	239.02
		Maharashtra	202.48	239.11	251.07	256.15	264.50	269.33
16	Revenue/Capital %	Kerala	118.26	179.90	146.47	151.6	189.10	132.70
		Karnataka	102.92	105.64	116.10	114.00	114.90	120.60
		Andhra Pradesh	131.79	142.46	120.66	118.14	105.93	106.82
		Gujarat	132.02	127.37	125.25	121.63	124.26	177.38
		Maharashtra	117.65	133.80	129.92	128.66	114.57	117.58
17	Total operating cost/Total Revenue % (9/15)	Kerala	0.95	0.92	0.75	0.81	0.79	0.90
		Karnataka	0.71	0.72	0.63	0.65	0.64	0.67
		Andhra Pradesh	0.61	0.64	0.64	0.67	0.71	0.70
		Gujarat	0.65	0.52	0.60	0.60	0.59	0.60
		Maharashtra	0.72	0.64	0.59	0.62	0.60	0.65
18	Fleet Utilization %	Kerala	78.70	83.80	86.30	84.00	83.90	83.60
		Karnataka	77.80	77.20	76.50	73.50	78.00	79.20
		Andhra Pradesh	86.98	87.51	93.29	93.30	87.90	92.00
		Gujarat	77.32	76.40	77.49	79.34	79.92	80.70
		Maharashtra	67.50	70.84	82.27	83.10	82.66	83.60

Appendix - V ( contd )

Sl No	Criteria	STU	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80
19	Total effective kilometres operated (lacs)	Kerala	1550.85	1782.89	2028.61	2060.00	2127.75	2242.47
		Karnataka	2277.92	2542.88	3141.82	3212.69	3250.58	3379.94
		Andhra Pradesh	3090.63	3695.28	4277.77	4861.87	5106.85	5840.61
		Gujarat	3750.33	3783.69	3973.36	4324.80	4763.49	5253.42
		Maharashtra	4238.19	4513.76	4893.76	5423.03	6137.42	6705.20
20	Vehicle utilization per day in kilometres	Kerala	272.80	284.00	282.12	270.80	269.13	266.73
		Karnataka	234.70	244.00	258.95	256.80	250.60	263.50
		Andhra Pradesh	306.72	302.02	305.97	306.49	309.00	315.00
		Gujarat	259.90	266.90	270.12	280.11	286.40	291.50
		Maharashtra	3235.30	236.40	239.30	245.10	249.60	250.10
21	Average passengers carried per bus per day	Kerala	709	825	708	731	800	847
		Karnataka	518	531	547	532	579	608
		Andhra Pradesh	506	512	541	558	586	613
		Gujarat	569	569	589	615	638	634
		Maharashtra	357	354	378	387	404	410

Appendix - V ( contd.)

Sl No	Criteria	STU	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80
22	Total staff per schedule	Kerala	11.10	11.30	10.05	10.02	10.20	11.20
		Karnataka	9.52	9.03	9.13	9.17	9.03	8.93
		Andhra Pradesh	10.81	8.69	9.95	10.55	10.78	11.02
		Gujarat	9.55	9.55	9.55	9.68	8.97	9.49
		Maharashtra	8.68	8.53	9.27	9.17	8.58	8.97
23	Breakdown/ 10000 kms	Kerala	2.30	2.40	1.74	1.82	2.80	3.00
		Karnataka	0.75	0.80	0.72	0.53	0.65	0.66
		Andhra Pradesh	0.94	0.86	0.81	0.73	0.86	0.91
		Gujarat	0.95	0.93	0.86	0.86	0.61	0.49
		Maharashtra	0.95	0.80	0.71	0.63	0.63	0.74
24	Accident/ lakh kms	Kerala	2.30	2.50	2.14	2.39	2.70	2.50
		Karnataka	0.32	0.32	0.32	0.35	0.35	0.36
		Andhra Pradesh	0.31	0.29	0.29	0.34	0.22	0.22
		Gujarat	0.38	0.35	0.35	0.34	0.35	0.36
		Maharashtra	0.58	0.51	0.41	0.39	0.41	0.39

Source : Compiled from Association of State Road Transport Undertakings, Report on the Performance of Nationalised Road Transport Undertakings, 1974-75 to 1979-80, CIFT, Poona.

**Appendix - VI**  
**Cost Break-up in KERTC (Rs. in Lakhs.)**

Sl No	Particulars	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72
1	Personnel	170.5	203.9	264.2	323.3	448.2	483.2	543.2
2	Fuel	120.2	136.6	198.8	188.6	226.5	232.2	258.8
3	Lubricants & oils	7.0	9.5	13.2	16.5	19.1	19.7	22.0
4	Tyres & tubes	48.6	53.4	93.0	106.1	136.5	113.9	107.9
5	Batteries	2.9	3.9	5.2	5.0	5.9	6.3	6.7
6	Spareparts	22.1	43.7	52.7	74.8	80.2	85.8	98.0
7	Other stores	23.4	16.4	20.6	20.9	24.9	28.8	27.4
8	Taxes	95.0	91.3	138.5	174.7	81.4	147.8	140.2
9	Depreciation	40.4	45.4	54.0	64.1	76.7	91.1	105.5
10	Interest & debt charges	35.0	35.9	40.0	45.0	59.9	64.6	74.4
11	Other expenses	9.2	10.5	12.4	13.9	15.8	16.7	22.5
12	Cost of materials	224.2	263.5	343.5	411.9	493.1	486.7	520.8
13	Total cost excluding taxes and depreciation	438.9	513.8	660.1	794.1	1017.0	1051.2	1160.9

Appendix - VI ( contd )

Sl No	Particulars	1972-73	1973-74	1974-75	1975-76	1976-77	1977-78	1978-79
1	Personnel	760.5	903.1	1229.5	1415.7	1451.4	1582.8	1901.2
2	Fuel	298.4	315.6	457.5	610.9	746.3	782.1	836.7
3	Lubricants & oils	33.9	40.6	118.1	102.8	110.6	115.3	122.9
4	Tyres & tubes	117.4	135.9	242.8	374.3	394.6	431.4	467.3
5	Batteries	7.2	11.3	17.3	30.1	21.4	55.0	13.6
6	Spareparts	129.1	125.9	122.6	178.4	258.2	283.5	332.3
7	Other stores	45.9	41.0	82.3	73.2	78.4	98.3	98.0
8	Taxes	246.6	284.2	243.3	244.7	546.0	436.2	638.3
9	Depreciation	136.2	159.6	180.0	191.8	221.3	256.3	276.4
10	Interest & debt charges	87.3	100.1	116.9	131.7	180.5	150.4	167.0
11	Other expenses	27.6	27.8	34.9	71.4	87.9	103.6	114.4
12	Cost of materials	631.9	670.3	1040.6	1369.7	1509.5	1765.6	1870.8
13	Total cost excluding taxes & depreciation	1507.3	1701.3	2421.9	2988.5	3329.3	3702.4	4053.4

Source (1) KERIC, Annual Administration Reports, various years.  
 (11) Statistical Section, KERIC, Trivendrum.

**Appendix - VII**  
**Stores Inventory Holdings in ISMIC**

(As on 31st March, Rupees in Lakhs )

Sl No	Particulars	1966	1967	1968	1969	1970	1971	1972
1	Fuel	1.6	1.6	1.5	1.8	1.9	1.8	2.5
2	Lubricants & Oils	1.9	3.7	2.3	3.2	4.5	4.1	5.0
3	Tyres and tubes	3.3	8.2	3.2	6.6	11.5	13.5	8.8
4	Batteries	-	-	-	-	-	-	0.5
5	Spareparts	46.4	47.8	61.8	73.5	82.0	82.0	84.6
6	Other stores	22.6	19.6	19.9	21.5	19.8	21.4	22.7
7	Total stores	75.8	80.9	86.7	106.6	119.7	122.8	124.1

Appendix - VII ( contd )

S.No	Particulars	1973	1974	1975	1976	1977	1978	1979
1	Fuel	2.5	1.9	3.5	3.6	3.1	3.5	3.5
2	Lubricants & Oils	2.5	1.3	4.2	5.8	2.3	0.9	1.7
3	Tyres and tubes	10.9	4.7	6.4	8.2	5.6	8.9	15.6
4	Batteries	1.3	0.2	7.0	1.1	1.6	0.6	0.6
5	Spareparts	106.7	112.3	98.0	79.5	44.7	100.0	101.6
6	Other stores	26.9	34.1	40.7	38.0	23.0	28.9	27.7
7	Total stores	150.8	154.5	159.8	136.2	80.3	142.8	150.7

Note : Other stores at the end of March 1966 to 1971 include batteries also.

Sources : (I) KSKIC, Annual Administration Reports, various years.  
 (II) Statistical Section, KSKIC, Trivandrum.

Appendix-VIII

Stores Purchases in ISRTC

( Rupees in Lakhs )

Sl No	Particulars	65-66	66-67	67-68	68-69	69-70	70-71	71-72
1	Lubricants & Oils	7.0	10.0	13.0	17.0	20.0	22.0	24.0
2	Tyres & tubes	42.0	63.0	84.0	109.0	139.0	118.0	105.0
3	Spareparts	41.0	55.0	60.0	87.0	89.0	85.0	101.0
4	Other stores (including batteries)	21.0	26.0	33.0	39.0	40.0	43.0	47.0
5	Total stores (excluding fuel )	111.0	154.0	190.0	252.0	288.0	258.0	277.0



Appendix • VIII ( contd )

Sl No	Particulars	72-73	73-74	74-75	75-76	76-77	77-78	78-79
1	Lubricants & oils	29.0	40.0	120.0	116.3	115.5	117.4	122.4
2	Tyres & tubes	120.0	130.0	244.0	387.8	393.2	474.2	475.6
3	Spareparts	144.0	131.0	134.0	241.8	313.1	297.2	364.7
4	Other stores (including batteries)	65.0	61.0	91.0	105.8	110.5	63.7	100.1
5	Total Stores (excluding fuel)	358.0	362.0	589.0	851.7	932.3	952.5	1062.8

Sources : (I) KSHIC, Annual Administration Reports, various years.

(II) Statistical Section and Stock Accounts Section,  
KSHIC, Tiruvardur.

**Appendix - IX**  
**Operational Units in KSRTC**

( as on 10-3-1982 )

<u>Depots</u>	<u>Subdepots</u>	<u>Operating Centres</u>
Neyyattinkara		
Trivandrum Central	Vishinjam Kattakkada	Kilimanoor
Attungal		
Trivandrum City		Vikas Bhevan
Pappanamcode		
Nedumangad		
Quilon		
Kottarakkara	Punalur Pathanamthitta	
Kayankulam		
Chengannur		
Kottayam	Ponmunnam Vaikom	
Thiruvalla		
Changanacherry		
Palai		
Alleppey	Shertallai	
Ernakulam		

## Appendix - LX (contd.)

<u>District</u>	<u>Subdistrict</u>	<u>Operating Centres</u>
Muvattupuzha		Moolamattom
Perumbavoor		Munnar
Alwaye		
Trichur	Ponnani	
	Guruvayur	Angamaly
	Chalakydy	
	Perinthalmanna	
Palghat		
Kozhikode		
Sultanbattary		Kalpetta
		Mananthody
Cannanore	Payyanur	
<hr/>		
Total 24	12	7
<hr/>		

### Appendix - X

**Rate Contract System operated by the Association of State Road Transport Undertakings ( ASRTU ),  
New Delhi.**

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#### Standing Committee

The Association of State Road Transport Undertakings ( ASRTU ) with office located at New Delhi, has established a Committee known as Standing Committee ( Supplies and Contracts ).

This Committee is headed by a Chairman and is comprised of 2 Controller of Stores, 3 Chief Mechanical Engineers, 2 Chief Accounts Officers, Executive Officer of ASRTU and Secretary, Standing Committee ( Supplies & Contracts ). The Chief Executives of all undertakings ( General Managers of Managing Directors ) are also the members of this Committee.

The following are the functions of this Committee.

- i. Invite open tenders
- ii. Negotiate with manufacturers
- iii. Finalise rate contracts
- iv. Place contracts or trial rate contracts
- v. Circulate the details of rate contracts amongst member undertakings
- vi. Lay down specifications for the items.

#### Procedure followed by Standing Committee

Open tenders are invited, by advertisement in the newspapers, in accordance with pre-set Calendar of tenders. The firms registered with D.G.S. A.D are exempted from payment

Appendix - X (contd.)

of earnest money deposit of Rs. 200,00. The tenders are expected to quote their best prices FOB destination and offer 1 % preferential reduction and quantity turnover discounts, on a slab basis, on the total purchases made, to the STUs. In addition, they are supposed to pay 2 % service charges, to the ASRTU. The tenderers are expected to give discounts on account of (i) prompt payment of their bills (ii) longer period of contract (iii) bulk orders with phased deliveries (iv) assistance for securing raw materials at controlled rates (v) Ex-works supply and (vi) cheaper or alternative mode of packing for bulk supply.

The tenders are finalised in the meetings of this Committee and after pre-audit by both the internal and external auditors, the rate contracts or trial rate contracts are issued, to the parties, incorporating the detailed rates, terms and conditions, etc. but without binding the quantity. These contracts are valid for a period of one year, subject to extension by another 3 months at the discretion of the Secretary, Standing Committee. Sometimes negotiations are also conducted, before finalisation of these contracts.

Any revision in prices is not allowed except (i) in the cases where the cost of raw materials has increased beyond the control of the tenderer subject to production of original invoice from the manufacturer of such raw materials; and (ii) whenever there is a fresh levy or increase in the statutory taxes.

The STUs place orders, without inviting any quotations or tenders, for the items for which rate contracts have been finalised by ASRTU.

**Appendix - XI**  
**Vendor Rating System in BEST Undertaking**

Purchase category : Casual/Annual/Advertised/  
Telephonic/Rate Contract

Name of the firm : \_\_\_\_\_

Purchase Sl Order number No date and tender number	Type of Ten- der	Performance			Any spl. remarks in favour of the tenderer
		Quantity A/B/C/D	Life A/B/C/D	Delivery A/B/C/D	
1					
2					
3					

**Criteria for rating**

**Rating**

**Quality**

- A** No rejection, or rejections upto 3 % of quantity on order for manufacturing defects which can be rectified.
- B** Rejections exceeding 3 % but not more than 5% of quantity on order for manufacturing defects which can be rectified.
- C** Rejections exceeding 5 % but not more than 10 % of quantity on order for manufacturing defects which can be rectified and upto 3 % which cannot be rectified.
- D** Rejections exceeding 10 % of quantity on order for manufacturing defects which can be rectified rejected.

## Appendix - XI (contd.)

RatingQuality

E

Non-genuine and spurious material irrespective of quantity.

Performance reports should be called from consuming departments, for items such as lamps, liners, springs, tyres, capacitors, transformers etc.

LifeRating

A &amp; B

Above the minimum guaranteed

C &amp; D

Below the minimum guaranteed

Delivery ( Ex-stock )Rating

A

Within 10 days of the date on which purchase order is placed.

B

On the 11th day or within the next 7 days from the date on which purchase order is placed.

C

Beyond the 18th day after the purchase order is placed.

D

No delivery - part or full

Delivery within stipulated periodRating

A

Within the quoted delivery period from the date the purchase order is placed. In case of phased delivery delay upto 7 days in the delivery of any instalment is permitted to be offset by the corresponding advance delivery of other instalments of the said contract.

## Appendix - XI ( contd )

Rating

- B** Delivery within 15 days of the date of delivery. In case of phased delivery delay upto 7 days in the delivery of any instalment is permitted to be offset by corresponding advance delivery of other instalments of the said contract.
- C** Beyond the quoted delivery date/date.
- D** No delivery - part or full



**Appendix - XII**  
**Derivation of the Economic Order**  
**Quantity ( EOQ ) formula**

**Symbols used**

TIC	=	Total incremental cost of Inventory
R	=	Annual requirement in number of units
C	=	Carrying cost of inventory per annum as a per cent of investment in inventory
S	=	Ordering cost, Rupees per order
P	=	Unit cost of material in Rupees
Q	=	Order quantity

**Total incremental cost = Ordering cost + carrying cost**

**Ordering cost = No. of orders per year X cost per order**  
**=  $\frac{R}{Q}$  X S. Rs. per year.**

**Carrying cost = Average Inventory X Unit cost X Carrying cost per cent**  
**=  $\frac{Q}{2}$  X P X C Rs. per year**

**TIC =  $\frac{R}{Q}$  X S +  $\frac{Q}{2}$  X P X C**

**Differentiating with respect to the order quantity Q yields the slope of the TIC curve.**

$$\frac{d \text{ TIC}}{d Q} = - \frac{RS}{Q^2} + \frac{PC}{2}$$

## Appendix - XII (contd.)

Setting this first derivative equal to zero identifies the point where the TIC is a minimum

$$-\frac{RS}{Q^2} + \frac{PC}{2} = 0$$

$$\frac{PC}{2} = \frac{RS}{Q^2}$$

$$\text{Simplifying, } Q^2 = \frac{2RS}{PC}$$

$$Q = \text{EOQ} = \sqrt{\frac{2RS}{PC}}$$

This is known as the Economic Order Quantity or the Square Root Formula.

$$\text{Optimal Number of Orders, } N = \frac{\text{Annual Requirement}}{\text{EOQ}}$$

$$= \frac{R}{\sqrt{\frac{2RS}{PC}}}$$

$$\text{Simplifying, } N = \sqrt{\frac{RC}{2S}}$$

$$\text{Optimal Review time, } T = \frac{\text{Year}}{\text{Optimal No. of orders}}$$

$$= \frac{1}{N}$$

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**B I B L I O G R A P H Y**  
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## I Primary Source Materials

- 1 Ministry of Transport and Communication, Report of Study Group on Transport Planning, Government of India, 1955.
- 2 V.V Ramanathan, Report on Road Transport Industry, Andhra University, 1955.
- 3 Ministry of Transport and Communications, Report of the Road Transport Reorganization Committee, Government of India, 1959.
- 4 Transport Research Division of Ministry of Transport and Shipping, Statistical Bulletin of State Road Transport undertakings of India, (annual publication), Government of India, New Delhi, 1958-59 to 1967-68.
- 5 Planning Commission, Preliminary Report of the Committee on Transport Policy and Coordination, Government of India, 1961.
- 6 Committee on Plan Projects, Digest of Studies on State Road Transport Undertakings in Relation to Inventory Control and Vehicle Maintenance, Planning Commission, Government of India, 1961.
- 7 Ministry of Transport and Shipping, Report of the study group on Transport, Coordination, Government of India, 1962-64.
- 8 Planning Commission, Final Report of the Committee on Transport Policy and Coordination, Government of India, New Delhi, 1966.
- 9 Ministry of Transport and Shipping, Final Report of the Road Transport Taxation Inquiry Committee, Govt. of India, 1967.
- 10 Joint Technical Group for Transport Planning, Transport Cost Studies, Rail and Road Transport, Planning Commission, Government of India, 1967.
- 11 Ministry of Transport and Shipping, Report of the study group on viable units, Government of India, New Delhi, 1968.

- 12 Ministry of Transport and Shipping, Report of the Study Group on Road Transport Financing, Government of India, 1968.
- 13 Transport Research Division of Ministry of Transport and Shipping, Review of Public Sector Road Transport ( annual publication ) Government of India, New Delhi, 1968-69, onwards.
- 14 Planning Commission, Report on the Metropolitan Transport Services, Government of India, 1970.
- 15 Association of State Road Transport Undertakings, Report of the Study Group on City Services, ASRTU, New Delhi, 1971.
- 16 Committee on Road Transport, Report on the Working of the Kerala State Road Transport Corporation, Government of Kerala, 1977.
- 17 Association of State Road Transport Undertakings, Report on the Performance of State Road Transport Undertakings in India, CIRT, Poona, 1974-75 onwards
- 18 National Council of Applied Economic Research, Road Transport Industry ( : A Review ), NCAER, New Delhi. 1979.
- 19 Planning Commission, Report of the committee on National Transport Policy, Government of India, New Delhi, 1980.
- 20 Kerala State Road Transport Corporation, Annual Administration Report, KSRTC, Trivandrum, 1964-65 onwards.
- 21 Maharashtra State Road Transport Corporation, Annual Administration Report, MSRTC, Bombay, 1974-75 onwards.
- 22 Andhra Pradesh State Road Transport Corporation, Annual Administration Report, APSRTC, Hyderabad, 1974-75 onwards.
- 23 Gujarat State Road Transport Corporation, Annual Administration Report, GSRTC, Ahmedabad, 1974-75 onwards.

- 24 Karnataka State Road Transport Corporation, Annual Administration Report, KRTC, Bangalore, 1974-75 onwards.
- 25 Ministry of Shipping and Transport, Motor Transport Statistics, various years, Government of India.

## II Secondary Source Materials

### A) BOOKS

- 1 Aljian, George W. (ed.), Purchasing Handbook, New York, McGraw Hill, 1966.
- 2 Ammer, Dean S, Materials Management, Homewood, Illinois, Richard D. Irwin, 1968.
- 3 Anyon, Jay.G, Managing an Integrated Purchasing Process, New York, Holt, Rinehart and Winston, 1963.
- 4 Arrow, Kenneth J., Samuel Karlin, and Herbert Scarf, Studies in the Mathematical Theory of Inventory and Production, Stanford, Stanford University Press, 1958
- 5 Baily, P.J.H., Purchasing and Supply Management, London, Chapman and Hall, 1978.
- 6 Baily, Peter and Farmer, David, Managing Materials in Industry, London, Gower Press, 1975.
- 7 Baily, Peter and Tavernier, Gerard, Design of Stock Control Systems and Records, London, Gower Press, 1977.
- 8 Ballot, Robert B., Materials Management : A Results Approach, American Management Association, 1971.
- 9 Barrett, D.A. Automatic Inventory Control Techniques, London, Business Books Limited, 1972.
- 10 Battersby, Albert, A Guide to Stock Control, London, Pitman Publishing Limited, 1977.
- 11 Berry, Harold A, Purchasing Management, Englewood Cliffs, New Jersey : Prentice Hall, 1964
- 12 Bowersox, Donald F, Logistical Management, New York : Macmillan Publishing, 1978.

- 13 Bowman, Edward H and Robert B. Fetter, ANALYSIS OF  
Production Management, Homewood, Illinois : Richard  
D. Irwin, 1957.
- 14 Brown, Robert G, Decision Rules for Inventory Management,  
New York : Holt, Rinehart and Winston, 1967.
- 15 \_\_\_\_\_, Materials Management Systems, New York :  
John Wiley, 1977.
- 16 \_\_\_\_\_, Smoothing, Forecasting and Prediction,  
Englewood Cliffs, N.J : Prentice Hall, 1963.
- 17 \_\_\_\_\_, Statistical Forecasting for Inventory  
Control, New York : McGraw Hill, 1959.
- 18 Buchan, Joseph and Koenigsberg, Ernest Scientific  
Inventory Management, New Delhi : Prentice Hall, 1977.
- 19 Buffa, Elwood S, Modern Production/Operations Management  
( 5th ed.), New York: John Wiley, 1950.
- 20 Buffa, E.S., and Miller, J.G. Production - Inventory  
Systems : Planning and Control ( 3rd ed. ) Homewood,  
Illinois : Richard D. Irwin, 1979.
- 21 Bureau of Public Enterprises, Guidelines for Materials  
Management in Public Enterprises, New Delhi : Manager  
of Publications, 1971.
- 22 Central Institute of Road Transport, Course Materials  
of the Correspondence Course in Transport Management,  
Volumes I, II and III, CIRT, Poona.
- 23 Chadha, R.S., Inventory Management in India, Bombay :  
Allied Publishers, 1974.
- 24 England, Wilbur. B, The Purchasing System, Homewood,  
Illinois : Richard D. Irwin, 1967.
25. England, Wilbur. B. and Leenders, Michiel R. Purchasing  
and Materials Management, Bombay : Taraporevala, 1978.
- 26 Fabrycky, W.J., and Banks, Jerry, Procurement and  
Inventory Systems : Theory and analysis, New York :  
Reinhold Publishing Corporation, 1957.
- 27 Fetter, Robert B. and Winston C. Dalleck, Decision  
Models for Inventory Management, Homewood, Illinois  
Richard D. Irwin. 1961.

- 28 Garrett, Leonard J and Silver, Milton Production Management Analysis, Second ed. New York : Harcourt Brace Jovanovich, 1973.
- 29 Gokarn, P.R., Essentials of Materials Management, Bombay : Sonaiya Publications, 1970.
- 30 Gopalakrishnan, P and Sandilya M.S., Purchasing Strategy : Text and Cases, New Delhi : Sterling Publishers, 1978.
- 31 \_\_\_\_\_, Inventory Management : Text and Cases, Macmillan Company of India, 1978.
- 32 \_\_\_\_\_, Stores Management and Logistics : Text and Cases, New Delhi : S. Chand & Company, 1978.
- 33 Gopalakrishnan P and Sundaresan M, Materials Management : An Integrated Approach, New Delhi : Prentice Hall, 1977.
- 34 \_\_\_\_\_, Spare Parts Management : Text and Cases, Bombay : Jaico Press, 1977.
- 35 Greene, James H, (ed.), Production and Inventory Control Handbook, New York : McGraw Hill, 1970.
- 36 Hansmann, Fred, Operations Research in Production and Inventory Control, New York : John Wiley, 1962.
- 37 Heinritz, Stuart. F. and Farrell, Paul. V, Purchasing : Principles and Applications, Englewood Cliffs, N.J. Prentice Hall, 1965.
- 38 Institute for Financial Management and Research, Inventory Management, Madras, IFMR, 1980.
- 39 Lee, Lamar. Jr. and Dobler, Donald W., Purchasing and Materials Management, New Delhi : Tata McGraw Hill, 1977.
- 40 Lewis, C.D., Scientific Inventory Control, London : Butterworths, 1970.
- 41 Magee, John. F and Boodman, David.N., Production Planning and Inventory Control, New York : McGraw Hill, 1967.
- 42 Mathew M.O., Road and Rail Transport, Madras : Scientific Book Agency, 1963.



- 43 Mathew, P.D., Handbook of Materials Management, Bombay : McHarty International, 1968.
- 44 Menon, K.S., Purchasing and Inventory Control, Allahabad : Wheeler Publishing, 1979.
- 45 Meredith, Jack R and Gibbs, Thomas E., The Management of Operations, New York : John Wiley, 1980.
- 46 Monks, Joseph G., Operations Management : Theory and Problems, Tokyo : McGraw Hill Kogakusha, 1977.
- 47 Morse, Philip M., Assets, Inventories, and Maintenance, New York : John Wiley & Sons, 1958.
- 48 Nadior, Eliezer, Inventory Systems, New York : John Wiley, 1966.
- 49 Nair, H.K., Materials Management, Bombay : Asia Publishing House, 1967.
- 50 Orlicky, Joseph, Materials Requirements Planning, New York : McGraw Hill, 1975.
- 51 Pavaskar, Madhoo, Second India Studies : Transport, Bombay : Popular Prakashan, 1978.
- 52 Peterson, Rein and Silver, Edward A., Decision Systems for Inventory Management and Production Planning, New York : John Wiley, 1979.
- 53 Plossl, G.W. and Wight, O.W., Production and Inventory Control : Principles and Techniques, New Delhi : Prentice Hall of India, 1979.
- 54 Prichard, James W and Eagle, Robert H., Modern Inventory Management, New York : John Wiley, 1965.
- 55 Ramanadham V.V., Nationalised Road Services in Hyderabad, Andhra University, 1956.
- 56 Ramaswami K.S., Transport in India, Madras : Anudha Nilayam Pvt. Ltd., 1957.
- 57 Raymond, Fairfield E., Quantity and Economy Manufacturing, New York : McGraw Hill, 1931.

- 58 Sharma, Santhosh, Productivity in Road Transport,  
New Delhi : Association of Road Transport Undertakings,  
1976.
- 59 Starr, Martin K and Miller, David W., Inventory Control:  
Theory and Practice, Englewood Cliffs, N.J: Prentice  
Hall, 1962.
- 60 Taff, Charles. A., Management of Physical Distribution  
and Transportation, Homewood, Illinois : Richard D.  
Irvin, 1972.
- 61 Thomas, Adin. B., Stock Control in Manufacturing  
Industries, London : Gower Press, 1968.
- 62 Wagner, Harvey M., Statistical Management of Inventory  
Systems, New York : John Wiley & Sons, 1962.
- 63 Westing, J.H., Fine I.V. and Zeng, Gary Joseph,  
Purchasing Management : Materials in Motion,  
New York : John Wiley & Sons, 1969.
- 64 Whitin, Thomas M., The Theory of Inventory Management  
Princeton, N.J : Princeton University Press, 1957.

B) ARTICLES/RESEARCH PAPERS/SEMINAR PROCEEDINGS

- 1 Agarwal, K.C., Economy Through Inventory Management,  
Journal of Transport Management, January, 1978.
- 2 Arasangovan, S.G., Computerisation of Inventory in Road  
Transport Organisation, Journal of Transport Management  
April 1979.
- 3 Saveja, G.C., Road Transport, Yojana, 29 November 1970.
- 4 Bagade, M.V., "What ails State Transport?" Comarcon,  
April 24, 1982. pp.686-692.
- 5 Central Institute of Road Transport, Inventory Control,  
Proceedings of the Workshop held from 24th to 26th  
October 1977 at CIRT, Poona.
- 6 \_\_\_\_\_ , Effective Provisioning and Sparesparts Management,  
Proceedings of the Workshop held from 5th to 7th March  
1979 at CIRT, Poona.

- 7                     , ABC Analysis in Inventory Control, Proceedings of the Workshop held from 19th to 21st July 1979 at CIRT Poona.
- 8                     , Demand Forecasting in Inventory Control, Proceedings of the Workshop held from 28th to 30th November 1979 at CIRT, Poona.
- 9 Chedha S.K., Some Econometric Studies on city Transport Services in the Public Sector, Occasional Research Papers Series, No. 1, September 1971.
- 10 Chand, B., Organisation and Management of Nationalised Road Transport Undertakings in India, Indian Journal of Commerce, September 1969.
- 11 Chandrasekharan G., Spareparts Management in Road Transport Industry, State Transport News, March 1977.
- 12 Chandra Prakash, R and Irani J.K., Some issues in Road Transport Management, Journal of Transport Management, June 1978.
- 13 Datta, D.C., On Factors Determining the Variation in the Rate of Return from State Road Transport Undertakings, Occasional Research Papers Series, No. 3, October 1971.
- 14 D'Souza, B.C., Road Transport in India, Economic Times, 17 July 1971.
- 15 Ganagan, P.V., MIS to Increase Productivity, State Transport News, May 1977.
- 16 Gupta J.N., Passenger Transport in the Public Sector, Journal of Indian Institute of Road Transport, January 1970.
- 17 Gupta, P.S., Road Transport Industry in India, Journal of Indian Institute of Road Transport, November 1970.
- 18 Joshi, R.C., Problems of the Municipal Bus Transport - Rising Costs and Social Obligations, Contributive documentation, ICAPE Road Passenger Transport Seminar Madras, October 1961.

- 19 Lulla, L.S., Corporation Pattern of Nationalised Road Transport Undertakings, Indian Journal of Public Administration, April - June 1962.
- 20 Mahesh Chami, Planning and Control of Motor transport, Eastern Economist, Annual Number, 1980.
- 21 Mantri, M.K., Purchasing : A Top Management Function, Journal of Transport Management, December, 1977.
- 22 Mathew P.V., Value Analysis for Import Substitution, Indian Management, December 1980.
- 23 Mathew P.V., Decision Tree : An Analytical tool for management, Decision, January - March 1981.
- 24 Murthy Rani, C.V.K., Road Transport in India, Journal of Automobile News, November 1970.
- 25 Patankar, P.G, Economy in Materials Management, Journal of Transport Management, December 1977.
- 26 Prakash, B.A., Urban Passenger Transport in Kerala, Journal of Transport Management, February 1979.
- 27 Prasada Jagdish, Nationalisation of Road Transport in U.P., Indian Journal of Public Administration, October - December, 1956.
- 28 Raghavachan S, The Problem of Bus Passenger Transport State Transport News, March 1971.
- 29 Ramasathan V.V and Mangesa N.K, Corporations Vs. Departmental Form in Road Transport, Indian Journal of Public Administration, January - March, 1960.
- 30 Rao, P.V., Nationalised Road Transport Services in Hyderabad, Indian Journal of Economics, July 1955.
- 31 Road Transport Operation Cost Committee, Report on Road Transport Operation Cost on various types of surfaces, Journal of Indian Roads Congress, 1961.
- 32 Sahu, L.N., Road Passenger Transport - Some Do's and Don'ts, Contributive documentation, ECAPS Road Passenger Transport Seminar, Madras, October, 1961.

- 33 Santhanas, T.S., Road Passenger Transport - The Challenge and Changes, Contributive documentation, ECAFE Road Passenger Transport Seminar, Madras, October 1961.
- 34 Satyanarayana, J.S., Nationalised Road Transport Undertakings, Osmania University, Hyderabad, 1967.
- 35 Satyanarayana, J.S., Road Transport in Public Sector, Osmania University, Hyderabad, 1968.
- 36 Satyanarayana, J.S., Cost structure of Road Transport Industry, Osmania University, Hyderabad, 1969.
- 37 Satyanarayana, J.S., External factors and Road Transport cost, Osmania University, Hyderabad, 1971.
- 38 Seshagiri Rao, C, Inventory Control for Tyres at Operating Depots of State Transport Undertakings, State Transport News, July 1973.
- 39 Shah, Mridula M, Passenger Transport by Autonomous Public Corporations I and II, Lok Udayog, August and September 1968.
- 40 Sundarasan, P., Public Sector Road Transport Management : A rejoinder, Journal of Transport Management, June 1978.
- 41 Sundaram K. Meenakshi, Capital's Nationalised Bus Service, Journal of Motor Transport, June 1971
- 42 Survey of Road Transport Industry and its Development, Journal of Motor Transport, December 1970.

#### C) DOCTORAL DISSERTATIONS

- 1 Patanbar, U.S., Passenger and Goods Transport Business in Poona, Poona University, 1962.
- 2 Sachdeva, Narendranath, Motor Transport in Madhya Pradesh, Agra University, 1962.

- 3 Saggar, Raj Kumar, Development of Motor Transport in Indian states with special reference to Punjab since Indianindependence, Punjab University, 1963.
- 4 Nagaraj, A, Nationalised Road Transport in Hyderabad State, Osmania University, 1967.
- 5 Ramadas, Rachokonda, Nationalised Road Passenger Services in India, Lucknow University, 1967.
- 6 Modak, S.K., Some aspects of Road Transport in Eastern Districts of Vidarbha, Nagpur University, 1968.
- 7 Suresh Chandra, A Study of the Nationalised Roadways of U.P. and its Future Prospects, Agra University, 1969.
- 8 Mahesh Chandra, Nationalised Road Transport in U.P., Lucknow University, 1969.
- 9 Halder, Dilip Kumar, Public Undertaking in Motor Bus Transportation in the City of Calcutta, An economic analysis and programming solutions, Poona University, 1970.
- 10 Sharma K.K., Motor Transport : Its development and Planning in Rajasthan, Rajasthan University, 1970.
- 11 Dixit, Madhav Chintawan, A Study of the Poona Municipal Transport Administration with reference to its service efficiency from 1959 onwards, Poona University, 1972.
- 12 Kulshrestha, Daksh Kumar, Economics of Bus operation in U.P., Agra University, 1973.
- 13 Das, D. Jayadeva, Administration of Kerala State Road Transport Corporation, Kerala University, 1974.
- 14 Satyanarayana, Yalawati, Management Planning and Control Systems in State Transport Undertakings, Poona University, 1976.
- 15 Achrya, Desodar, Some Optimisation models for management of repairables in bus transportation systems, III. Kharagpur, 1977.

- 16 Choudhury, Vinay Krishna, Bihar State Road Transport Corporation: A study in the commercial and financial aspects of a public enterprise, Bhagalpur University, 1977.
- 17 Pathak, Moreswar Gajanan, Road and Road Transportation in Marathwada, Marathwada University, 1977.
- 18 Joshi, Harish Chander, Problems and Prospects of Road Transport, Muzam University, 1978.
- 19 Alwin Prakash, B., An Economic Assessment of The Performance of the Kerala State Road Transport Undertaking in the period 1959-71, Kerala University, 1978.
- 20 Gokte, Vasant Krishna Rao, A study in the Administration of the Delhi Transport Corporation with special reference to its personnel, Delhi University, 1978. .
- 21 Shitole, Vijay kumar Sidhivinayak, Passengers and Goods Transport Business in Kolhapur city, Shivaji University, 1978.
- 22 Mehta, Narayan Shankar, Madhya Pradesh Rajya Sadak Parivahan Nigam Arthik sarvakahan ( Hindi ), Saugar University, 1978.
- 23 Prabhakar, Naresh Chander, Development of Road Transport in Jammu and Kashmir State since 1942, Jammu University, 1978.
- 24 Balakrishnan, V, Road Transport in Kerala with special Reference to the Kerala State Road Transport Corporation, Calicut University, 1979.
- 25 Mohandas, S. Kirupakara, Pricing in Passenger Transport Services by Road with special reference to Tamil Nadu, Madras University, 1979.
- 26 Vijayakumar, K.C., A Study of the Rate and Freight Structure of Road Transport in Kerala with Special Reference to Kerala State Road Transport Corporation, Calicut University, 1979.

- 27 Sharma, Chiranjil Lal, Road Transport in the Union Territory of Delhi, with special reference to the working of the Delhi Transport Corporation, Meerut University, 1979.
- 28 Bagade, N.V., Management Information System for Passenger Bus Transport Industry, Poona University, 1981.

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