INVENTORY MANAGEMENT IN PUBLIC SECTOR ELECTRICAL INDUSTRY IN KERALA

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By
CHANDRA BOSE D.

Under the Supervision and Guidance of
Dr. K. C. SANKARANARAYANAN

DEPARTMENT OF APPLIED ECONOMICS
COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY
COCHIN - 682022

AUGUST 1995

Dr. K. C. SANKARANARAYANAN
PROFESSOR

HEAD OF THE DEPARTMENT
DEPARTMENT OF APPLIED ECONOMICS
COCHIN UNIVERSITY OF
SCIENCE AND TECHNOLOGY
COCHIN - 682 022
PHONE: OFF. 85-6030
RES. 85-6394

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Certificate

Certified that the thesis "INVENTORY MANAGEMENT IN PUBLIC SECTOR ELECTRICAL INDUSTRY IN KERALA" is the record of bona fide research carried out by **Mr.Chandra Bose.D**, under my guidance. The thesis is worth submitting for the degree of Doctor of Philosophy in Commerce under the Faculty of Social Sciences.

(Dr.K.C.Sankaranarayanan)

Declaration

I declare that this thesis is the record of my bona fide research carried out by me under the supervision of **Dr.K.C.Sankaranarayanan**, Professor and Head of the Department of Applied Economics, Cochin University of Science and Technology. I further declare that this has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar title of recognition.

Cochin 682 022,
21 Aug. 1995.

Chandra Bose.D

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Chapter I

Introduction

Public sector is a unique feature of many developing countries in the world. In India, it is accepted as consistent with the ideology of mixed economy. Since independence, this concept has been nurtured and promoted with great interest by the successive Governments. Among the various public sector enterprises, electrical undertakings run by the states occupy a significant place.

Industrialisation is an important means of modernization. The increased pace of industrialisation in India, in its wake, highlighted a number of managerial problems. Among them, the problem of inventory management is significant. The need for efficient management of available resources in any business organisation requires no emphasis and a public sector electrical undertaking which is expected to be run efficiently on business principles is no exception. The electrical undertakings run by the states are silent spectators witnessing the ever increasing cost of input which contributes to nearly 60 per cent of the total cost. All the powers of the Government to increase the price of the finished products remain ineffective on account of the acute competition in the business. Left with no choice, the public sector electrical undertakings are forced to manage its available resources more efficiently.

The role of capital is crucial in the context of industrial development. It is all the more true in the case of capital scarce countries like India. The capital raised by a firm is invested in fixed assets and current assets for carrying on its activities. The portion invested in current assets is called the working capital and the inventory constitutes the largest proportion of it. Thus inventories call for efficient management. Good inventory management is good financial management also. One must agree with the observation that "when you need money, look at your inventories before you look to your bankers."[1]

Efficient use of capital in an undertaking helps to provide maximum customer service and earn profit in the process. These objectives can be achieved with the given amount of capital, either by maximizing the output or by maximizing the margin of profit or by a combination of both. It would mean that the management must try to make this capital work as fast as possible, which is often difficult to materialize. It is also impossible to raise the margin of profit extensively due to competition in business. Thus capital turnover and productivity of capital often become totally ineffective.

Several modern techniques have been developed and employed by managers as a solution to this problem. Among these, inventory management is the most effective. It enables a manager to increase productivity of capital by reducing material costs, preventing blocking up of large working capital for long periods and improving capital turnover.

The concept of inventory management has been one of the many analytical aspects of management. It involves optimization of resources available for holding stock of various materials. Lack of inventory can lead to stock-outs, causing stoppage of production and a very high inventory will result in increased cost due to cost of carrying inventory. Thus optimization of inventory should ensure that inventories are neither too low nor too high.

Inventories like finished products, work-in-progress, components. raw materials, stores. spares etc., account for 80 per cent or more of the working capital in some of the industries (Table 1.1). It would appear that any effort for rationalization of inventories will bring about an appreciable saving. But a scientific system of control can reduce investment in inventories considerably, sometimes as much as 50 per cent or even more.[2]

Table 1.1

Percentage of Inventory on Working Capital

Sl. No.	Name of industry	Total Working Capital (Rs. in lakhs)	Investment in inventories, materials, finished goods, and work-in-progress (Rs. in lakhs)	Percentage of (3) to (2)
	(1)	(2)	(3)	(4)
1.	Sugar	8,016	7,675	96
2.	Starch	213	197	92
3.	Paints & Varnish	356	323	91
4.	Cement	1,801	1,679	93
5.	Cotton Textiles	19,668	18,563	94
6.	Chemicals	3,826	3,117	81
7.	Iron and Steel	3,974	3,131	79
8.	Bicycles	452	403	89

Source: Chadda R.S., Inventory Management in India (New Delhi: Allied Publishers (P) Ltd., 1968), p.102 (Prepared from the Twelfth Census of Indian Manufacturers, 1957, Central Statistical Organisation, Calcutta).

In accordance with the study made by the Industrial and Mining Team of the Committee on Plan Projects, the management of some public sector industrial and other undertakings has accepted the reduction in inventories[3] (Table 1.2).

Table 1.2

Reduction in Inventories Accepted by the Management of Some Public Sector Industrial and Other Undertakings

Sl. No.	Class of Inventory	Average stock before study (in time supply)	Average stock agreed to after study (in time supply)	Reduction
1.	Finished Goods	3.28 months	1.40 months	57%
2.	Spares Parts	14.50 months	8.00 months	44%
3.	Finished Goods	2.23 months	0.50 months	80%
4.	Spares Parts	30.00 months	7.50 months	75%

Source: Indarjit Singh and Chadda, Inventory Control in Industry (New Delhi: Universal Book Stall, 1966), p.256.

This study examines the working of the inventory management departments of the public sector electrical industrial units in Kerala and suggests methods to improve their efficiency. In this chapter, various aspects of inventory management, its scope and need in industry are detailed.

Historical Aspect

In olden times an individual's wealth was usually assessed by the size of his blocks, granaries and warehouses. But with the advent of modern industrialisation, wealth has become more identified with money. There has been a strong tendency towards holding the means to purchase goods and services rather than goods themselves. Inventories are now often referred to as the graveyard of business as surplus stocks have been the principal cause of business failures.

Modern managers have made a complete change in the outlook of inventory holdings on account of:[4]

(1) increasing size of the business establishments,

(2) wide variety and complexity of modern requirements and

(3) urgency of modern requirements.

In the U.S.A., there are so many professional societies concerned with inventory management. The biggest of these is the National Association of Purchasing Management, which has roughly twice the membership of the American Production and Inventory Control Society, the second ranking organisation. While each of these groups is concerned with the broad problems of materials management, it is significant that each focuses its major emphasis on a segment of the materials management process—purchasing in one case and production and inventory control in the other.[5]

In contrast to the situation in the United States inventory management is firmly established in Japan, where the Material Management Society is the major organisation of this type.[6] Similarly, the Institute of Purchasing and Supply, which is identified as the British equivalent of the National Association of Purchasing Management has been set-up to provide greater emphasis to materials management activities other than purchasing.

Inventories in India, whether in the private sector or in the public sector are much higher than those in the United States and Western Europe mainly on account of the substantial different procurement positions. But even with regard to the nationally available materials the supply position is difficult and the means of transport are inadequate.

Inventory management has been attracting the attention of managers in India for a long time. But with the credit squeeze measures announced by the Government of India and the consideration of the Tandon Committee for inventories, top management is deeply involved in developing suitable norms for inventory control. Tandon Committee appointed by the R.B.I. dealt with prescribing inventory norms towards industries for the smooth running with no stock out.[7]

Meaning and Function

Inventories are resources of any kind having an economic value. It consists of raw materials, work-in-progress, finished goods, consumable and stores. Thus inventory control is planning and devising procedures to maintain an optimal level of these resources.

Inventory functions as a bank and decouples successive stages of operation.[8] Materials, manufacturing and marketing departments are the three operating sub-systems. Finance and personnel control are the non-operating sub-systems. The material sub-system procures the input, the manufacturing sub-system converts it and the marketing sub-system sells the output. The other sub-systems like finance and personnel control serve the needs of the three operating sub-systems.

Need for Inventory

Primarily, inventory is held for transaction purposes.[9] Today's inventory is tomorrow's consumption. A business cannot maintain a given volume of sales without maintaining sufficient inventory to satisfy its customers. In the field of production, an enterprise cannot ensure uninterrupted production unless it maintains adequate inventory of raw materials.

Inventory is also held as a precaution or as a contingency for increase in lead time or consumption rate. Sometimes, there is speculative element in the reasons for holding inventory. It largely takes into account the expectation of changes in price/cost over a period of time. Finally, inventories are held to decouple the materials department from the consuming department.

Background and Problems

Most of the public sector electrical industrial units in Kerala have been working under conditions of stress and strain with erratic market fluctuations and stiff competition since 1982. Owing to cut-throat competition in the metre, transformer and cable markets, prices of these goods are falling down. But at the same time prices of raw materials and components that go into the making of these goods are alarmingly on the increasing side. These peculiar phenomena have thrown the electrical industry in the State of Kerala out of gear.

As a result of the adverse working conditions and unfavourable and unworkable prices, most of the public sector electrical industrial units in Kerala have been incurring losses since 1982. At this juncture, certain drastic measures are highly essential to revive and rejuvenate these industrial units.

The inventory management policy of the public sector electrical industrial units in Kerala has direct influence on its profitability and risk. The liquidity of an electrical unit can be strengthened by increasing the level of investment in inventory. But increased liquidity through increased levels of inventory decreases its returns because more funds will be tied up in current assets than are absolutely necessary. To raise the rate of return, the liquidity will have to be sacrificed by reducing the level of investment in inventories to the minimum. The inventory management of the public sector electrical industry in Kerala, therefore, involves a risk return trade off. This is the problem of the study.

Literature Survey

A number of surveys and studies have already been made in the area of inventory management practices in Indian industry. Most of these studies are directly or indirectly connected with the inventory management practices of public and private sector industries in India. But there is no single scientific study which deals with the inventory management in the public sector electrical industry in Kerala. A brief review of the available literature is presented in the following paragraphs.

The Bureau of Public Enterprises[10] (1978) highlighted the present status of spare parts management in public enterprises. The study states that every unit should endeavour to have a spare parts planning cell entrusted with long-term and short-term planning for spare parts. It also throws light on the training of personnel in spare parts management and selective control of spare parts.

The faculty members of the Administrative Staff College of India[11] (1977) reviewed the Tandon Committee norm of spare parts inventory management practices in India. The review shows that the Tandon Committee norm of spare parts inventory of five per cent of total inventory is irrelevant to most of the industries, since the bulk of their inventory is in spare parts only.

Mathew's[12] (1978) study "Materials Management Practices in Public Sector Undertakings in India," concludes with the statement that the functions concerned with materials have to be toned up to achieve increased profitability.

The study conducted by Mathew[13] (1982), "Materials Management in State Road Transport Undertakings in India with Special Reference to K.S.R.T.C.," highlights the need for integrated organisational set-up for the materials department. It is found in this study that an integrated organisational set-up for the materials department enables reduction in the overall cost of materials. He also suggests further research in this area.

The faculty members of the Jamnalal Bajaj Institute of Management[14] (1972) conducted a study,"Control Practices in Indian Industry." The coverage of the study had to be restricted because of lack of response from most companies. Of the 224 companies approached only 36 responded; and among them only 13 reported using inventory control techniques. The findings of the survey indicate that while most organisations are still guided by rules of thumb and intuition in deciding as to how much capital is to be invested in inventories, there is a gradual shift towards more scientific methods for determining inventory levels.

The Institute for Financial Management and Research[15] (IFMR-1980) emperical study analysed the pattern of inventory ratios in public sector undertakings and public limited companies in the private sector. The analysis of inventory ratios shows that there is considerable scope for reducing the spares inventory in the engineering and process industries and for reducing consumables in the process industry.

Daniel and Viyyana Rao[16] (1990) found in their study "Materials Management in Andhra Pradesh State Road Transport Corporation (APSRTC)" that since the transport undertakings involve huge expenditure on materials front, even as little as one per cent improvement in the efficiency will result in substantial gain. In their view, some of the inventory problems concerning planning of purchases and transportation can be successfully handled—through Programme Evaluation Review Technique (PERT), Critical Path Measurement (CPM), and Operations Research (OR) even in times of uncertainties.

Suresh[17] (1986) in his article "Materials: A Potential Area for Improving Profits" points out that the control of material costs makes the organisation stand competitive and be on the top in the world of business.

Murali and Sinha[18] (1991) state in their article "Inventory Management: A Probe and Scope in Coal Mining Industry" that a dynamic approach to the various aspects of inventory management will invariably lead to the achievement of real and permanent reduction in the cost of production of coal.

Xlao-Gao Liu, et. al.[19] (1993) in their article "Role of Maintenance Manufacturing Management" point out that properly designed maintenance programmes can enhance the overall system performance of an industrial unit by reducing the need for inventory, smoothing production flows and/or improving product quality.

Prem Vrat Saurabh Mittal and Kavi Tyagi[20] (1993) in their article, "Implementation of JIT in Indian Environment" state that there is a need to improve the work environment before JIT can be implemented in India.

Ghosh[21] (1987) in his article "Management of Spare Parts Inventory" points out that with the availability of infrastructure facility all over the country and the introduction of new concept like spare parts bank, the difficulty of managing spare parts inventory will be eased out.

Sankaran Venkateswar[22] (1991) in his article "Manufacturing Environment in the 1990s and Beyond" states that inventory management can be simplified through the incorporation of Advanced Manufacturing Technologies (AMT) and philosophies into the strategic plan of the organisation.

Sukumaran Nair[23] (1995) in his article "Flexible Specialisation and Developing Economics" emphasises that the just-in-time character of flexible specialisation enables economies to maintain low level of inventories.

Objectives of the Present Study

The above review shows that the studies on the present practices of inventory management in industries in India are profuse, while an analytical study comprehensing the inventory management practices in the public sector electrical industry in Kerala is highly essential. The present investigation aims to fill in this lacuna with the following objectives in view:

(1) Get an overall view of the system of inventory management in the public sector electrical industry in Kerala.

(2) Assess the positions and levels of inventory in the electrical undertakings.

(3) Analyse the inventory management policies and practices followed by the electrical undertakings.

(4) Analyse the organisational set-up for materials in the electrical undertakings.

(5) Examine the liquidity of the electrical undertakings.

(6) Examine whether there are any selective and analytical techniques of inventory management in the electrical industry run by the State of Kerala and if so, to analyse its working and management attitudes towards it.

(7) Compare and contrast the inventory policies of one undertaking with those of the others.

(8) Suggest measures based on the findings of the study for the improvement of the working of the system, wherever possible.

Hypotheses

The following hypotheses are formulated for the study:

(1) The existing organisational set-up, practices and systems are inadequate to ensure efficient management of inventories in electrical industry.

(2) Inventory constitutes the largest proportion of the working capital in electrical undertakings run by the State of Kerala.

(3) Efficiency in management of inventories leads to improvement of profitability of the concern.

(4) Introduction of scientific inventory techniques has a favourable effect on the workings of inventory departments.

(5) There is no uniform inventory policy on the working of the material departments of the various electrical undertakings.

(6) The inventory cost of the public sector electrical undertakings in Kerala is much higher than that of the private sector electrical undertakings.

(7) The financial performance of the public sector electrical undertakings is not at all satisfactory on account of the high raw material costs, heavy borrowings and huge interest burdens.

Scope and Methodology

The scope of this study is limited to the assessment of savings in inventories of electrical products due to inventory management.

The electrical industry in various sectors has grown considerably and consequently the working capital blocked up in inventories has also gone up. With rapid modern development in management, various effective tools and techniques have been evolved for efficient management of inventories. Many firms have taken advantage of these new developments and restructured their inventory management department in tune with the modern trend and have obtained the benefits of cost reduction. Some firms are in the process of getting their personnel trained while many others have not yet initiated to tone up their inventory divisions and get their personnel trained. As a result, the inventories in various forms still remain high in these firms and a major opportunity for cost reduction is being lost.

Electrical undertakings of private sector in Kerala are careful to make at least some savings in inventories by effecting both internal and external economies, as otherwise their very existence itself will be threatened. The internal economies in the public sector are not so effective as those of the private sector on account of social responsibilities and obligations. Most of the public sector undertakings in Kerala were making heavy losses until a few years back and even now the return on their investment is nowhere comparable to that of the private sector.

There are possibilities to reduce the cost of purchased materials by competitive bidding, value analysis etc., while savings in the cost of holding inventories can arise out of economic ordering, reducing deterioration and obsolescence in storage etc., and thereby reducing the working capital blocked up.

The above methods have been used with great success in foreign electrical firms and in the private sector electrical undertakings in Kerala. And there is good scope for further improvement of these techniques in electrical undertakings run by the State to arrive at suitable recommendations to increase their efficiency and profitability. This is essentially the scope of the study.

Data Sources

There are only five public sector electrical undertakings in Kerala. The various units and factories of these undertakings have been selected for the purpose of study. Details of these undertakings are given in chapter three.

The investigation is mainly analytical; both primary and secondary data are used. The primary data were collected through field studies and interviews using schedules. Secondary data were collected from various published sources like newspapers, magazines, industrial directories, etc. Materials supplied by the previous research activities have also been of great help.

Information on inventory and data regarding recurring expenditure are collected from each unit for various time periods.

Period of Study

The study covers a period of ten years from 1980-81 to 1989-90.

Method of Analysis

The methodology followed is to project the cost reduction of the inventory department on the basis of data collected and to validate this projection with the aid of analysis and survey.

Ratio analysis is the primary method used in this study. The collected data are analysed with the help of various inventory and financial ratios to highlight the different aspects of inventory management. Standard accounting and statistical tools are also used wherever necessary. The results of the analysis are presented in the form of time series tables.

Limitations of the Study

The main limitation of the study is that the data obtained relate to the period 1989-90 and earlier and the current position is not available. However, it would not substantially affect the findings since no major changes have taken place with regard to the objectives and programmes of the inventory department of the public sector electrical undertakings in Kerala during this period.

Another limitation is that uniform norms cannot be applied to evaluate different inventory management organisations as the structure and geographic locations under which they work are very much different from the rest of the organisations.

Chapter Scheme

The thesis is organised under eight chapters. The first chapter presents the various aspects of inventory management, function and need of inventory, justification for the present study and a brief outline of the research topic, area of the study, objectives, hypotheses, and the methodology of the study. The second chapter presents the organisational set-up for materials as seen by the researchers. Electrical industry in India—an overview is presented in the third chapter. The fourth chapter examines the relationship of the working capital and inventory to the public sector electrical industry in Kerala. While the fifth chapter describes some concepts about inventories, the sixth chapter presents the tools and techniques of inventory management. This is followed in the seventh chapter by an analysis through inventory ratios. The last chapter presents a summary of the findings and conclusions of the study.

Notes

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Chapter II

Organisational Set-up for Materials

The need, significance and scope of materials management in public sector electrical undertakings in Kerala have been discussed in the first chapter. In such undertakings, the overall materials job should be divided into many different jobs under some sort of organisational structure and then grouped into assignable working units through functional integration. The degree of economy would depend largely on the soundness of the organisational set-up on functionalism, control and co-ordination.

In this chapter, different aspects of organisational set-up, its importance, objectives, structure, need for co-ordinated set-up for materials and its effect on total cost and other related aspects are examined. After comparing these with the existing practices in the organisations studied, conclusions have also been drawn.

Importance of Effective Organisational Set-up

Materials management is an important function in the public sector electrical undertakings and its improvement could be a significant factor indeed in the struggle for improved earnings. When these undertakings were initially established, almost all functions like purchasing, storing, manufacturing, traffic, inventory control etc., could be performed by the chief executive or by a few key individuals without any serious problem of overlapping functions.[1] But now, as the firm's business expands it becomes necessary to specialise or secure the help of others to concentrate specifically on the respective areas. This is because of the fact that one cannot possibly be a specialist in all the fields of business activity.[2]

As long as business is on a small scale, its management can be kept well informed on all phases of its activities. Thus an undertaking can make best choices and decisions where various alternatives are available.[3] When the firm's business expands the number of specialists needed to control and manage various activities also expands. These specialists make decisions which are money savers. At the same time, some decisions which may save costs in one specialist's area may have negative effects on the costs in another specialist's area, virtually none being aware of the reasons for the increased cost. This can be overcome only through an effective organisational set-up.[4]

Organisational Objectives

An organisational structure should be in line with the functions to be performed and the objectives to be achieved.[5] Organising the inventory function to obtain the appropriate contribution to objectives is one of the challenges of management in the public sector electrical undertakings. Every undertaking has its objectives which include supply of goods and services, earning a surplus, being a leader in the field of its activity, ensuring welfare of its employees etc. The organisational policies, programmes and schedules are so set as to achieve these objectives for the enterprise as a whole and in turn for each component of the business.

Organisational Structure

The output of an undertaking mainly depends on innumerable activities which are to be followed in the process of building effective organisational structure. These activities consist of assigning duties and responsibilities clearly and definitely to the various departments, determining the requirements and qualifications most suited to occupy such positions and defining the operating tasks of personnel and the responsibilities associated with each task.

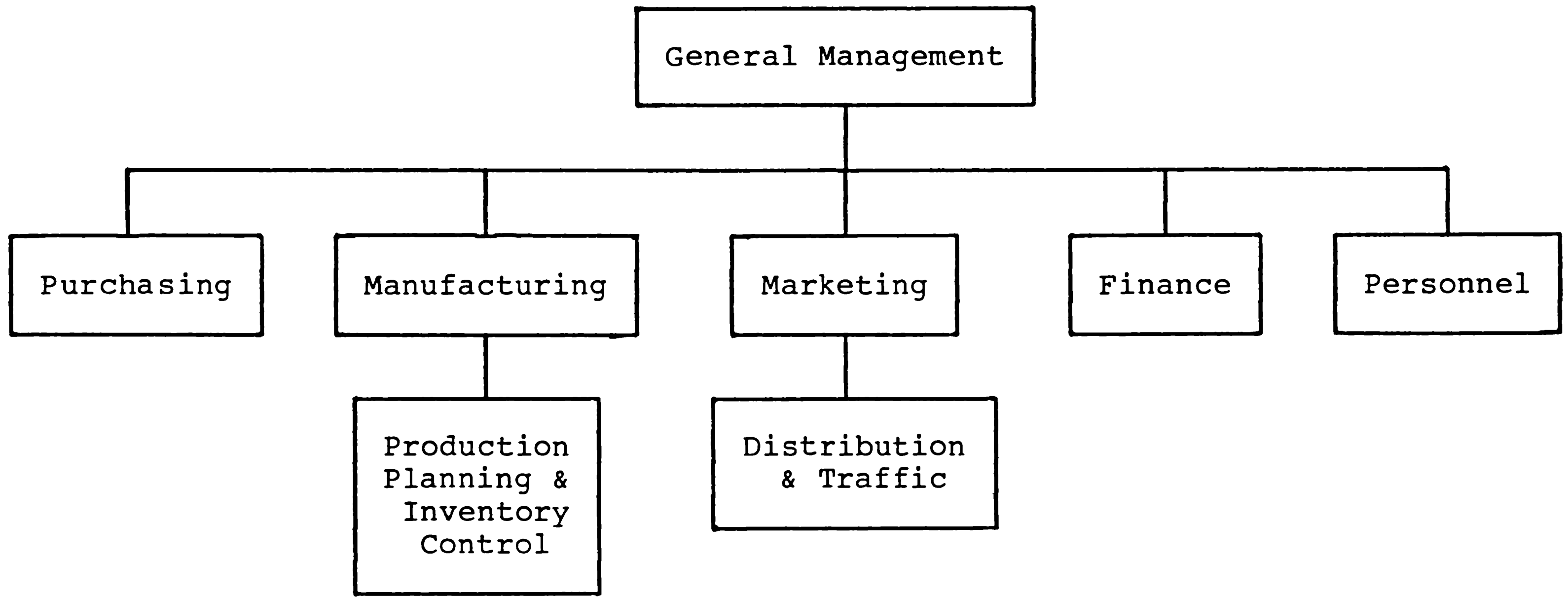
An economic and effective material organisational structure should have the following essential elements:[6]

(1) An organisational structure should be sound, flexible and dynamic mentioning duties and responsibilities of personnel for each department and their interrelationship.
(2) Experienced and trained personnel to manage these departments efficiently and economically.
(3) Co-ordination of various material activities for the accomplishment of enterprise objectives.
(4) Periodical check on the performance so as to initiate timely remedial measures.
(5) Functional decentralisation.
(6) Proper delegation of authority.
(7) Proper assignment of responsibility.

Of the various public sector electrical undertakings in Kerala, the organisational structure of United Electrical Industries Limited (U.E.I.) is shown in Figure 2.1 for the purpose of analysis.

Figure 2.1

Organisational Structure of United Electrical Industries Limited



In the organisation structure of U.E.I., the main functions of purchasing, manufacturing, marketing, personnel and finance are arranged on a line with each other (Figure 2.1). Then, production planning and inventory control would report to the manufacturing function, and distribution and traffic would report to marketing. After the product is produced, it is turned over to the marketing function for distribution. Purchasing is found as a separate function in this structure.

When the basic essentials of the organisational set-up and the practices followed in the public sector electrical undertakings in Kerala have been studied and compared, it is found that none of them has a full-fledged integrated materials management set-up. All these undertakings have taken the functions of purchasing, production and distribution as separate activities. Thus it is subjected to the following defects:

(1) Built-in Conflict of Authority Between Purchasing and Production Control Departments

These two departments rarely work well and conflicts are frequent. Purchasing department is responsible for selecting suppliers, and production control is responsible for obtaining purchased materials. If materials are not delivered on time, production control is supposed to do something about it. But, of course, so is purchasing which picked the supplier who failed.

(2) Impossibility of Tighter Inventory Control

Both Purchasing and Production Control Departments have a built-in bias towards high inventory. When the management complains, each can usually fix the blame on the other. Production control is directly responsible for inventory control, but every decision taken by Purchasing Department to buy an article is also an inventory decision. Purchasing is responsible for buying at the lowest price. Since the average unit price usually varies inversely with lot size, purchasing has a built-in incentive to buy in large quantities. This boosts the average inventory level. While production control may be responsible for maximizing inventory turnover, it has vested interest in large inventory because it is responsible for making certain that manufacturing is supplied with materials.

(3) Lack of Efficiency in Co-ordination

In most cases, there is a chance to increase purchase cost on account of the absence of annual purchase contracts, material substitution and value analysis. In the undertakings studied, production control and purchasing personnel have spent thousands of hours per year communicating with one another to assure good performance.

(4) **Impossibility of Good Communication**

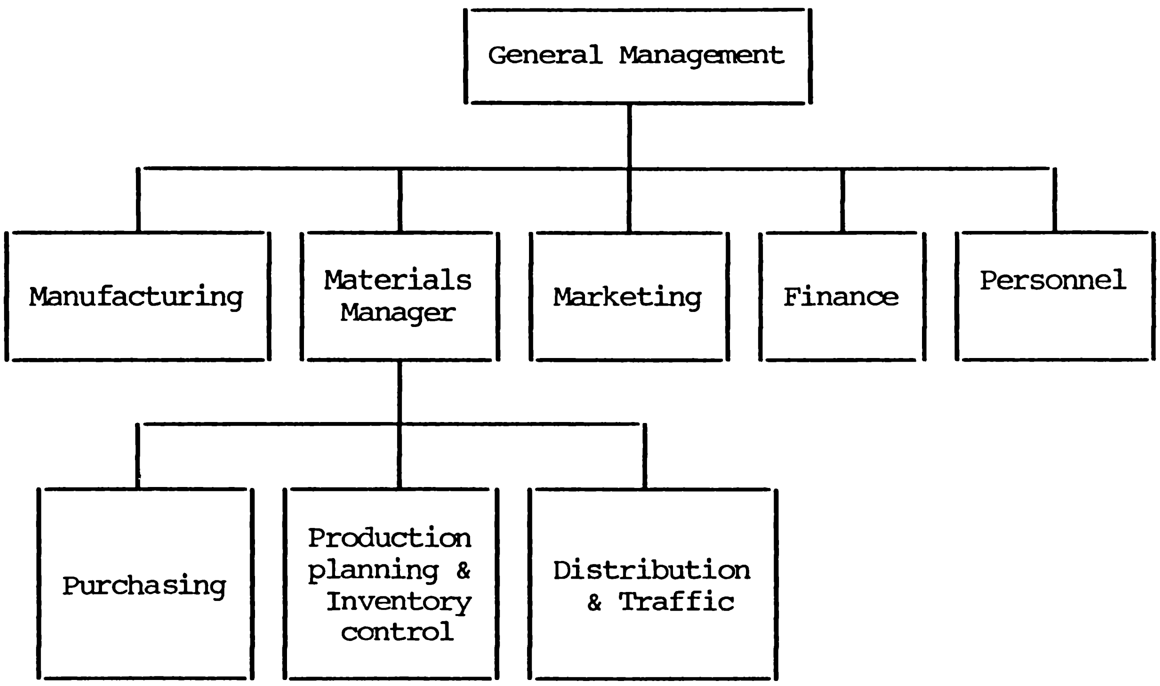
There is often a built-in conflict of interest between the manufacturing organisation and the various materials management activities that are under its control. Thus actions on various proposals will remain dormant for years.

On account of the aforesaid defects in the existing organisational structure, certain modifications are to be made in it. Under these modifications, the functions of purchasing, production and distribution cannot be taken as separate activities. But they are three aspects of a single broad activity. Thus one person, the materials manager, should control all the activities of physical movement of materials.

A particular form of material organisation most appropriate for one undertaking may not be the best form for another undertaking on account of the product and locational differentiation. However, in general an integrated materials management structure can be followed in the public sector electrical undertakings in Kerala. In this structure, the materials manager has co-equal status with the other main functions, and has overall responsibility for purchasing, production planning and inventory control, and distribution and traffic (Figure 2.2).

Figure 2.2

Modified Organisational Structure (Integrated Form)



In the modified organisational structure (integrated form), the materials manager can exercise high degree of co-ordination and control in all material activities. Since these activities are different stages of a single function, there should be a single line of command running through them.

Integrated form also helps in the rapid transfer of data through effective and informal communication channels. Thus it ensures savings in cost and improvements in the service levels.

A central materials manager who has equal status with those in engineering and production enjoys better support and co-operation in the accomplishment of materials function. This creates an atmosphere of trust and generally better relations between the user departments and the materials management department.

Needs for Co-ordinated Set-up for Materials

In an electrical undertaking raw material passes through various stages in the process of being converted into a finished product. Co-ordination and control are essential pre-requisites to make this flow effective and economical. Various forces arise on the part of the management to rethink the design and the significance of the interrelationship of the firm's operating function.

The first force stems from the recurring shortage of basic materials evident in today's economy. Such volatile supply situations are bound to continue and become more complex in the future. Thus efficient and effective operation of all material activities will be a requirement for business survival.

Another force generates from the current trend towards factory automation.[7] An uninterrupted material flow is highly essential in the case of an automated production. Nonavailability of a single production material of the proper quality and in the right quantity can shut down an entire segment of the production operation.

The third force arises due to the division of authority of production planning and purchasing between two different operating units. This division inevitably leads to conflict. Such conflict can be resolved much more easily through co-ordination between purchasing and production control.

Another force generates on account of the necessity to pinpoint the weak link in the material chain for remedial action, when material or inventory cost or any other costs are out of tune.

The last force arises on account of the make or buy policy of the undertaking. Where the cost of a product can be reduced the emphasis is to buy parts rather than make them. This may increase the volume of purchases to some extent which simultaneously increases in inventory holdings. Hence the control of the activities of inventory and its cost will be even more important than it is today:

> "Without idling the existing capacity if components or other items of quality can be procured from outside sources at cheaper rates buying is preferred rather than (sic) making them at the shops."[8]

Effect of Co-ordination on Total Cost

An undertaking can bring effective control over its cost only when it is analysed and controlled as a total operating unit (a total system). So the purpose behind integration is to reduce total cost associated with the acquisition and control of materials. Moreover, a firm cannot attain optimum costs unless its various activities are co-ordinated.

Unco-ordinated cost reductions can be misleading, because cost reductions made in one area frequently appear as increased costs in another area.[9] For instance, purchasing costs can be reduced by buying in larger quantities and passing increased carrying costs along to inventories. Or inventories can be reduced by passing additional costs along to (i) production, in the form of manufacturing delays and for possible downtimes, and (ii) purchasing, in the form of higher ordering costs resulting from the use of slower methods of transport can be passed along as increased inventory costs and possible production delays. Packing costs can be reduced by passing the costs along to material handling and customer claims.

The efficiency and economy effected in material operations through integration are a direct reflection of the organisational effectiveness. It can be seen from:

(1) The low cost of purchases as a result of annual purchase contracts, material substitution and value analysis.

(2) Maximum inventory turnover[10] by regulated ordering, selective inventory control[11] and a staggered material flow.

(3) Low carrying and acquisition cost through low inventories and economic quantity ordering.

(4) Minimum shortage with continuous flow of supplies through proper chasing and follow-up.

(5) Good quality supplies through proper specifications, standardisation and selective inspection of incoming materials, and

(6) Reliable sources of supply and cordial relations with the suppliers through prompt payment, proper public relations and periodical discussions on product development.

The income and expenditure distribution of the public sector electrical undertakings in Kerala during 1989-90 show that most of the undertakings earned profits only between 1.5 and 6.0 per cent of sales as against raw material consumption between 56 and 76 per cent of sales (Tables 2.1, 2.3 and 2.4 and Figures 2.3, 2.5 and 2.6).

At the same time the Transformers and Electricals Kerala Limited and the Metropolitan Engineering Company Limited incurred losses of 15.21 per cent and 2.16 per cent of sales respectively as against the raw material consumption of 71.35 per cent and 64.06 per cent of sales respectively (Tables 2.2 and 2.5 and Figures 2.4 and 2.7).

The analysis of Tables 2.1, 2.2, 2.3, 2.4 and 2.5, reveals that absence of an intelligent approach to the various functions involved in the acquisition and use of materials leads to lower profits and higher losses. Thus co-ordinated materials organisational set-up can be considered one of the best remedies for it.

Table 2.1

Income and Expenditure Distribution in

Kerala Electrical and Allied Engineering Company Limited

During 1989-90

Sl. No.	Item	Total Rs. in lakhs	Percentage of Sales
1.	Receipt by sale of products	2,946.98	
2.	Raw materials, chemicals etc., consumed	1,659.21	56.30
3.	Power, fuel and water charges	30.91	1.05
4.	Excise duty	477.80	16.21
5.	Other expenses	59.72	2.03
6.	Personnel expenses	300.90	10.21
7.	Interest and bank charges	123.48	4.19
8.	Selling and distribution expenses	29.70	1.01
9.	Administration expenses	106.12	3.60
10.	Depreciation	28.52	0.97
11.	Service charges to Government	85.18	2.89
12.	Profits	45.44	1.54
	Total	2,946.98	100.00

Source: Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1990) pp.118-119.

Figure 2.3
Expense Distribution in Kerala Electrical & Allied Engg.Co.,Ltd. During 1989-90

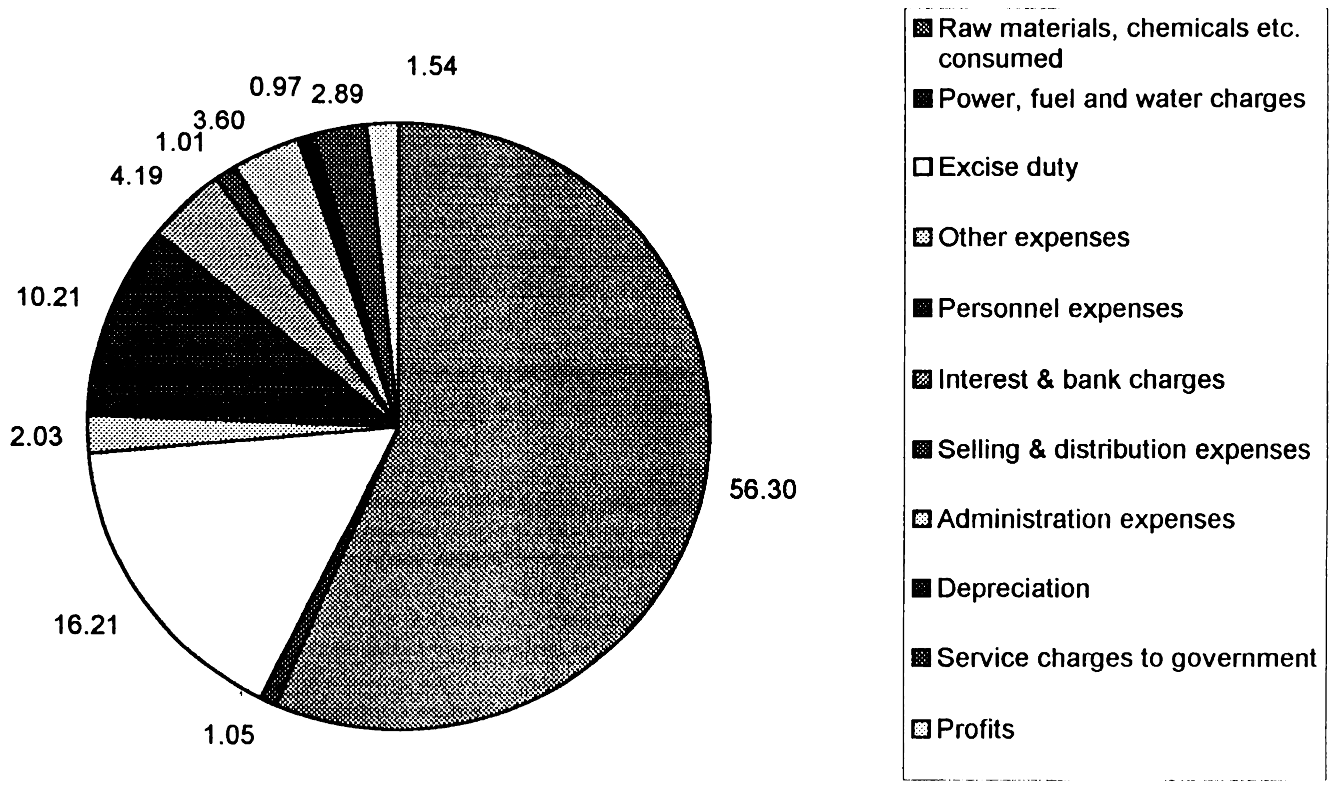


Table 2.2

Income and Expenditure Distribution in Metropolitan Engineering Company Limited During 1989-90

Sl. No.	Item	Total Rs. in lakhs	Percentage of Sales
1.	Receipt by sale of products	171.00	
2.	Raw materials, chemicals etc., consumed	122.00	71.35
3.	Power, fuel and water charges	0.80	0.47
4.	Excise duty	---	---
5.	Other expenses	3.45	2.02
6.	Personnel expenses	26.50	15.49
7.	Interest and bank charges	40.00	23.39
8.	Selling and distribution expenses	0.25	0.15
9.	Administration expenses	4.00	2.33
10.	Depreciation	0.01	0.01
11.	Loss	-26.01	-15.21
	Total	171.00	100.00

Source: Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1990) pp.123-124.

Figure 2.4
Expense Distribution in Metropolitan Engg. Co .,Ltd. During 1989-90

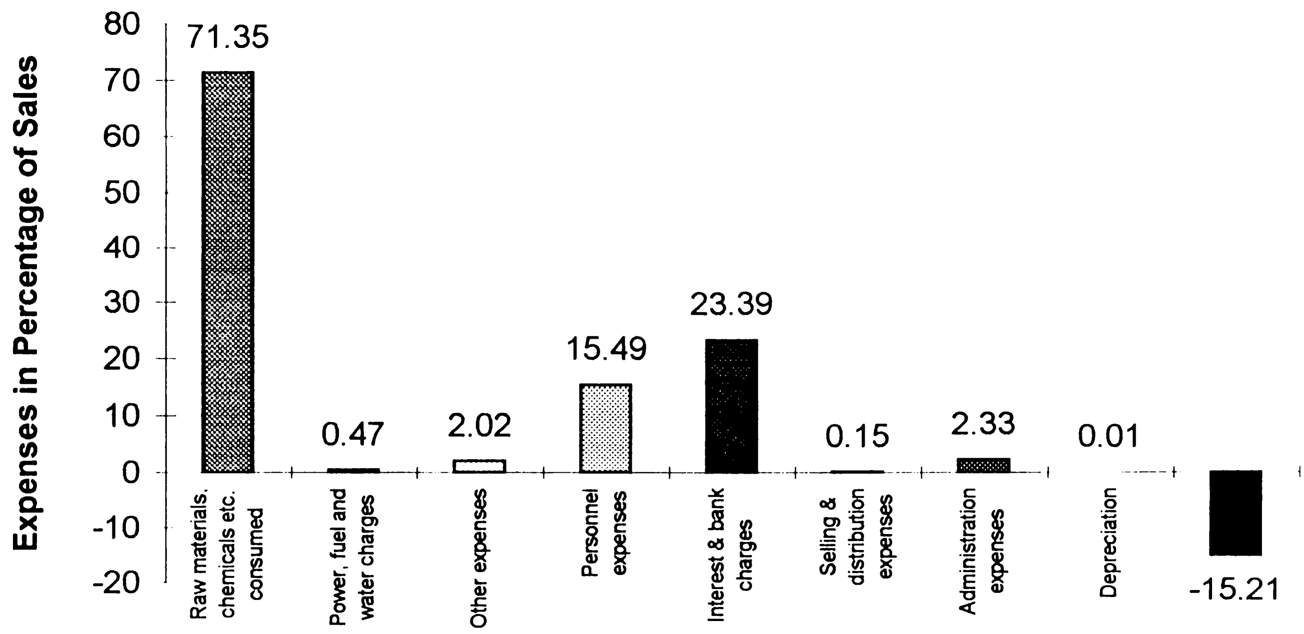


Table 2.3

Income and Expenditure Distribution in

United Electrical Industries Limited During 1989-90

Sl. No.	Item	Total Rs. in lakhs	Percentage of Sales
1.	Receipt by sale of products	611.23	
2.	Raw materials, chemicals etc., consumed	348.10	56.95
3.	Power, fuel and water charges	3.61	0.59
4.	Excise duty	---	---
5.	Other expenses	---	---
6.	Personnel expenses	151.10	24.72
7.	Interest and bank charges	31.48	5.15
8.	Selling and distribution expenses	9.46	1.55
9.	Administration expenses	22.23	3.64
10.	Depreciation	8.25	1.35
11.	Profit	37.00	6.05
	Total	611.23	100.00

Source: Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1990) pp.127-128.

Figure 2.5

**Expense Distribution in United Electrical Industries Ltd.
During 1989-90**

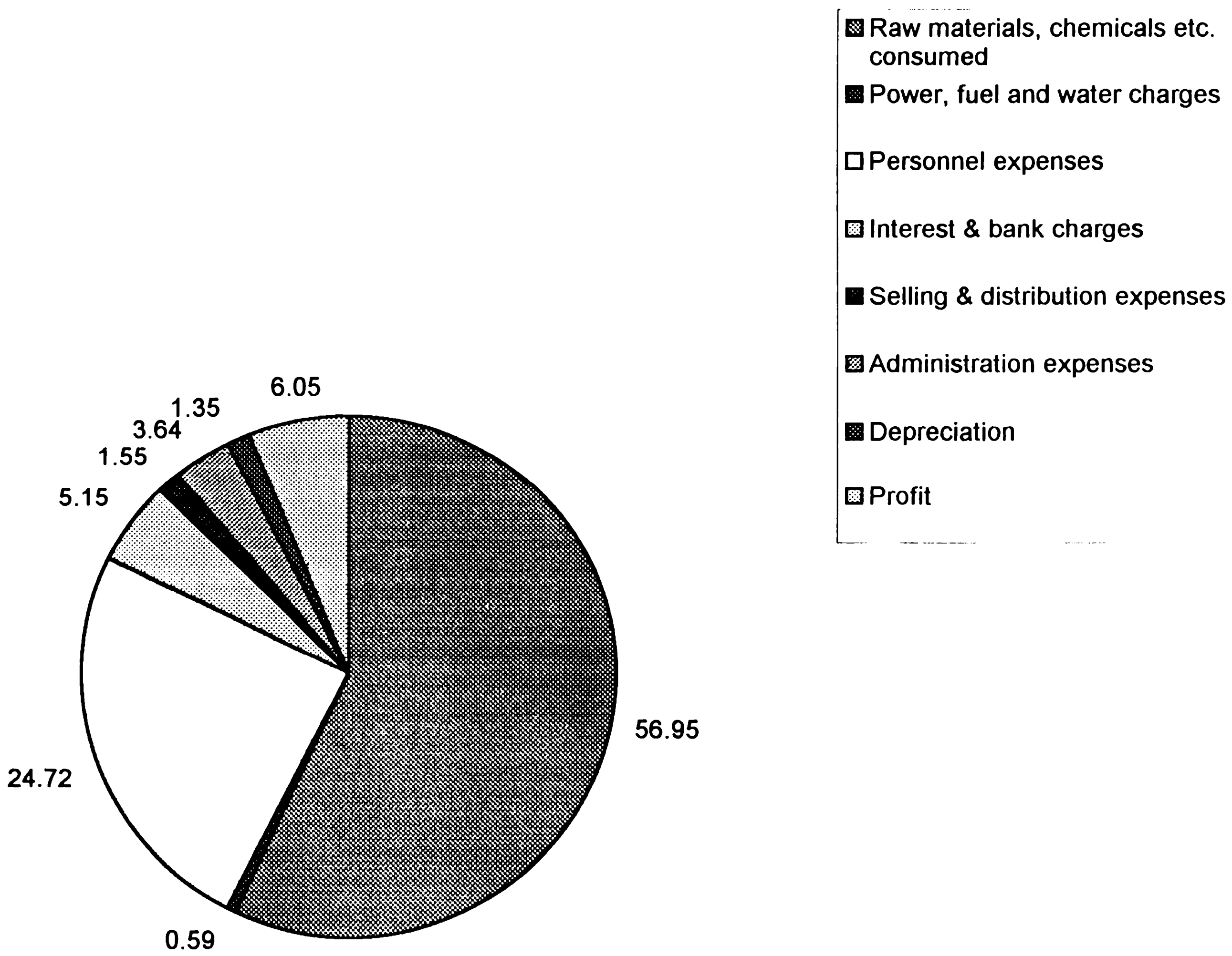


Table 2.4

Income and Expenditure Distribution in

Traco Cable Company Limited During 1989-90

Sl. No.	Item	Total Rs. in lakhs	Percentage of Sales
1.	Receipt by sale of products	782.92	
2.	Raw materials, chemicals etc., consumed	597.71	76.35
3.	Power, fuel and water charges	5.79	0.74
4.	Excise duty	---	---
5.	Other expenses	5.65	0.72
6.	Personnel expenses	88.80	11.34
7.	Interest and bank charges	24.31	3.11
8.	Selling and distribution expenses	2.91	0.37
9.	Administration expenses	10.05	1.29
10.	Depreciation	7.00	0.89
11.	Profit	40.70	5.19
	Total	782.92	100.00

Source: Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1990) pp.132-133.

Figure 2.6

Expense Distribution in Traco Cable Co. Ltd.
During 1989-90

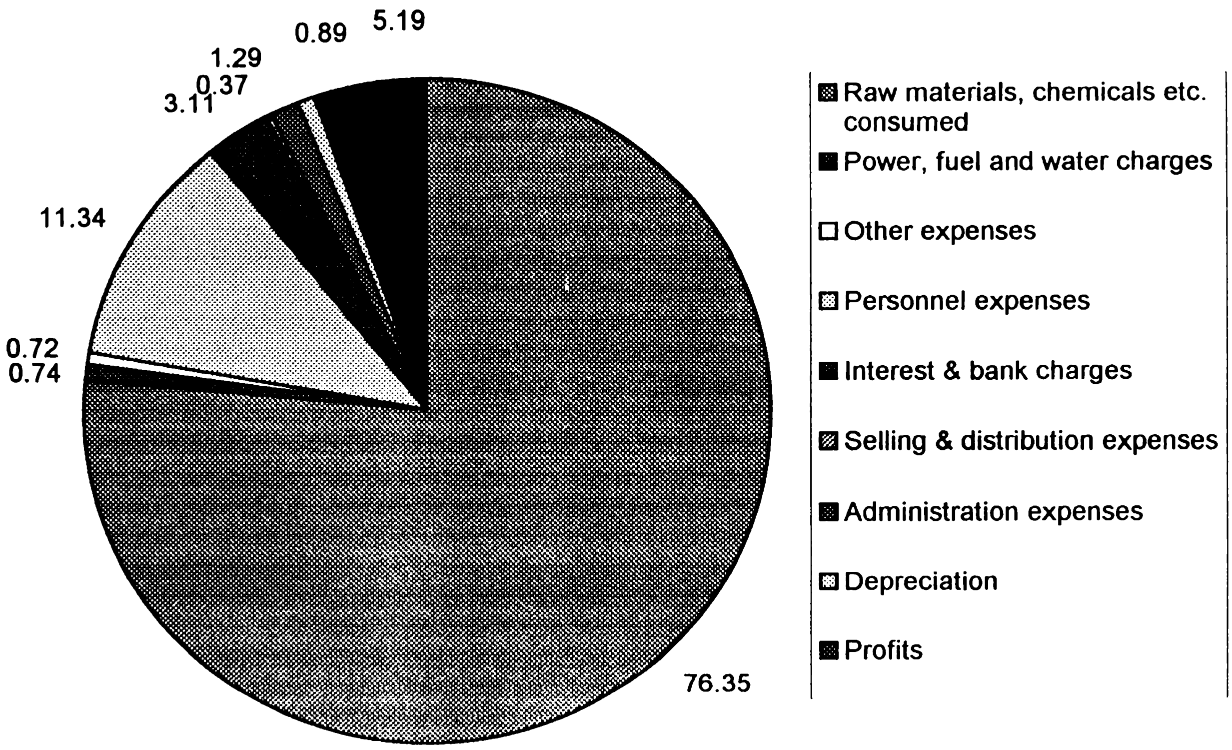


Table 2.5

Income and Expenditure Distribution in

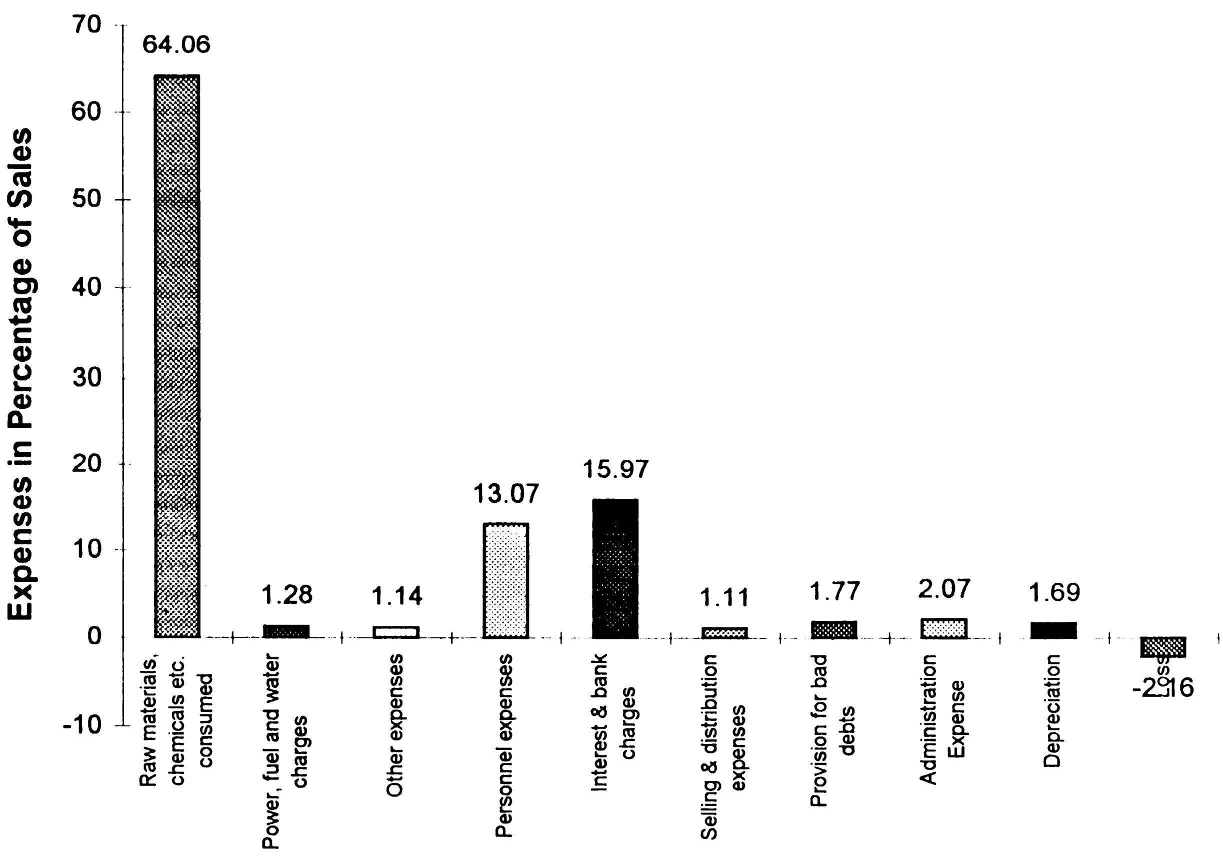
Transformers And Electricals Kerala Limited During 1989-90

Sl. No.	Item	Total Rs. in lakhs	Percentage of Sales
1.	Receipt by sale of products	4,229.82	
2.	Raw materials, chemicals etc., consumed	2,709.72	64.06
3.	Power, fuel and water charges	54.41	1.28
4.	Excise duty	---	---
5.	Other expenses	48.02	1.14
6.	Personnel expenses	552.96	13.07
7.	Interest and bank charges	675.31	15.97
8.	Selling and distribution expenses	47.14	1.11
9.	Provisions for bad debts	75.03	1.77
10.	Administration expenses	87.14	2.07
11.	Depreciation	71.50	1.69
12.	Profit/Loss	-91.41	-2.16
	Total	4,229.82	100.00

Source: Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1990) pp.136-137.

Figure 2.7

Expense Distribution of Transformers & Electricals Kerala Ltd. During 1989 - 90



Conclusion

Although the public sector electrical industrial units in Kerala are at present wedded to the existing system, the system popular and prevalent all over the world is integrated organisational set-up. However, most of the activities of an electrical industrial unit can be integrated to achieve economy in its total operation even if the pattern of set-up may vary on the basis of the size of the undertaking, location of its factories and mode of purchases. Moreover, an undertaking cannot effect any significant savings in cost and improvements in the service level unless it adopts an integrated organisational set-up for materials.

Only very recently has integrated material management concept gained greater acceptance in the field of public sector electrical undertakings in Kerala. Although these undertakings may not adopt a totally integrated approach, there is a definite tendency to move towards the integrated approach. Only professionally qualified managers can fulfil the requirements of an integrated materials management function. This has created the need for the development of professional managers.

Notes

[1] Drucker Peter, F., Managing for Results (New Delhi: Allied Publishers, 1977) p.76.

[2] Dayne L. Mac Naughton., Introduction to Business Enterprises (New York: John Wiley and Sons Inc., 1966) pp.206-210.

[3] Morris, T., Management Decisions (Illinois: Richard D. Irwin Inc., 1964) pp.81-90.

[4] Earnest Dale., The Great Organisers (New York: McGraw Hill Book Co., 1960) pp.71-79.

[5] Alan Mumford, The Manager (Britain: Pitman Publishing House, 1971) pp.58-76.

[6] Miller, J.B. and Gilmour, P., "Materials Managers: Who Need Them, " Harvard Business Review, July-Aug. 1979, p.74.

[7] Tom Burns and Stalker, G.M., The Management of Innovation (London: Tavistock Publications, 1961) pp.77-82.

[8] Magee, J.F., and Boodman, D.M., Production Planning and Inventory Control (New York: Mc Graw Hill Book Company, 1963) pp.143-148.

[9] Lamar Lee Jr. Donald W. Dobler., Purchasing and Material Management: Text and Cases (New Delhi: Tata Mc Graw Hill Publishing Company Limited, 1977) pp.18-25.

[10] Richard, J.N., op.cit, p.139.

[11] Buchan, J., op.cit., p.241.

Chapter III

Electrical Industry in India

The existing organisational set-up, its defects and modified organisational structure of materials management in the public sector electrical undertakings in Kerala have been discussed in the second chapter.

Electrical industry is one of the greatest growing industries in India. It constitutes seven per cent of the total manufacturing industries in the country. The rate of growth of the electrical industry showed a declining trend from 1981-82 to 1986-87 (Table 3.1). It was 13.2 per cent during 1981-82, but declined to 6.58 per cent during 1986-87.

Electrical industry is expected to provide ample opportunities for the development of ancillary units. The value added by this industry to the total industrial scene is around 8.90 per cent[1] (Report by the High Level Committee, 1984).

Table 3.1

Rate of Growth of Electrical Industry Group

from 1981-82 to 1986-87

(in per cent)

Year	Growth Rate 1981-82 to 1986-87
1981-82	13.21
1982-83	12.54
1983-84	9.20
1984-85	10.42
1985-86	3.17
1986-87	6.58

Source: Vijay L. Kelker et. al., "Industrial Growth in the Eighties: Emerging Policy Issues," Economic and Political Weekly, Vol. XXV, No. 4, 1990: p.59.

There is only a limited study which deals with various aspects of electrical industry in India. However, a few studies of electrical industry related to other countries are available.

Jules Backman's (1960) noted study on "Economics of Electrical Machinery Industry" deals with the classification of electrical machinery pricing of the product, marketing and profit margin in the context of the American Economy. Ayhan Cili Ngiroeelu's (1960) study on "Manufacturing of

Heavy Electrical Equipment in Developing Countries" deals mainly with the techniques used for the manufacture of heavy electrical equipments.

Another important study is about Brazil's Electrical Industry, namely "Transnational Conglomerates and the Economies of Dependent Development—A Case Study of International Electrical Oligopoly and Brazil's Electrical Industry" by Richard New Farmer (1974). It presents the origin and growth of the electrical industry in Brazil and also the technological advances in this field.

"A Study of the Linkages of Electrical Machinery Industry in Kerala" by Ushakumari (1991), points out that electrical industry is one of the greatest growing industries generating linkages—both forward and backward. 'The Power Sector in India' by Dileep M. Wage (1979) and 'The Electrical Lamp Industry' by Arthur Bright (1949) are the other studies worth mentioning.

The development of electrical industry has to be studied in the context of the development of electricity supply industry. The reason for this approach is that the power plant industry was established during the third plan, the accent being on extending power supply to the rural areas. A significant development during this phase was the emergence of interstate power grid system. Indian manufacturers produce the entire range of electrical equipment required for power generation, transmission, distribution and utilisation of electrical energy. Large-scale and small scale units are active in this sector.

Since the inception of planning, generation of power in the country has shown a phenomenal rate of growth both qualitatively and quantitatively. The installed capacity has grown from 1,362 MW (1947) to about 64000 MW (1990). This represents an increase of about 47 times. Of this, a capacity addition of 22,245 MW was envisaged in the seventh plan, against which the achievement was 22,123 MW (99.45 per cent). This includes a capacity of 9,175 MW which was installed but not energised. Despite this tremendous increase in supply of power, demand has outstripped supply. The shortfall in energy availability at the end of the Seventh Plan (1989-90), on an all India basis was 7.30 per cent.[2] The gap in the peak demand and availability was 17.90 per cent.

The Bharat Heavy Electricals Limited (BHEL) which is entrusted with the task of developing the entire heavy electrical equipment manufacturing programme in the country, expanded operations for the manufacture of power generating equipments for thermal (including boiler) hydro-electric and nuclear power stations. Additionally it produced equipment for transmission and distribution of power such as switch gear, transformers and large size motors. In recent years, it has also diversified its production to produce compressors, high speed turbines, boiler auxiliaries and so forth. High speed turbines and their auxiliaries are being manufactured at Bhopal, Hardwar and Hyderabad. The current emphasis by the Government is on setting up Super Thermal Power Stations in the country of 1500 and 2000 MW capacity, for which BHEL is also planning to establish facility for manufacture of large unit sized (200 and 500 MWS) sets.[3]

There are only two manufacturers of boilers in the country. They are the Thiruchirappalli unit of BHEL and ACC-vickers Babcock at Durgapur. There are 15 manufacturers of power transformers in the country, of which five are equipped to manufacture transformers of 220 KW capacity. Manufacture of the nuclear power plant equipment in India is being handled mainly by BHEL and Larsen and Toubro.

Electrical industry in India is also a contributory of exports of the engineering goods. India's engineering export is one of the top foreign exchange earners and accounts for 11.90 per cent of the export in 1989-90.[4] Exports of storage batteries, cables and wires account for

Rs.154.00 crores of the total of Rs.1,469.20 crores of engineering goods exported (major products) during 1989-90 (Table 3.2).

Table 3.2

Engineering Goods Export—Major Products

Commodities	Values 1989-90 (Rs. in crores)
Complete vehicles	196.00
IC Engines and parts	138.00
Management and technical services	135.00
Auto pans	135.00
Textile and jute machinery	133.00
Bicycle and parts	125.00
Hand small and cutting tools	104.00
Wires and cables	88.00
Storage batteries	86.00
Steel pipes and tubes	75.00
Machine tools	74.70
Steel structures fabricated	68.00
Industrial casting	58.00
Air compressors	53.50
Total	1,469.20

Source: Presentation and Studies, <u>Monthly Commentary</u>, Sept. 1991: p.iv.

India's overall growth in industrial output during the various plan periods has a close linkage with that of the engineering industry (Table 3.3).

Table 3.3

Linkage Between the Overall Growth in Industrial Output and that of the Engineering Industry in India

Plan period	Industrial Production (per cent)	Engineering Production (per cent)
2nd Plan	6.6	8.7
3rd Plan	9.0	21.8
4th Plan	3.7	5.8
5th Plan	6.2	6.7
6th Plan	6.3	5.2
7th Plan	8.4	11.7

Source: Presentation and Studies, Monthly Commentary, Sept. 1991: p.iii.

Cables and Wires

The power cable industry in India began in the year 1923 with the manufacture of power cables by Indian Cable Company, followed by National Insulated Cables in 1942. Today the cable industry boasts of an estimated

Rs.400.00 crore worth of power cable sales. Out of this about 50 per cent is cornered by PVC cables, manufactured by some 25 units in the organised sector and over 500 in the small scale sector. Apart from the PVC insulated cables, India manufactures a wide variety of others like paper insulated lead covered cables (PILC), Polyester Insulated Jelly Filled Cables (PIJF), Cross Linked Polyethene Cables (XLPE) etc.

In the year 1980, there were 14 units manufacturing cables in India in the organised sector manufacturing PVC, PILC and XLPE Cables, with an installed capacity of 41.20 thousand crore kilometres (CKM). By 1985, the total number of units increased to 23 and the installed capacity for all kinds of power cables in the country was 70 thousand CKM. The demand as envisaged by the planners is estimated to be 50300 CKMs in 1994-95 and 67,500 CKMs in the year 2000 A.D. The present installed capacity is quite adequate to meet this projected demand provided the capacity utilisation is reasonably high. But the performance of cable units on this score presents a dismal picture.

The year 1980 witnessed a capacity utilisation of 61 per cent with a production of 25.10 thousand CKM, whereas in 1985 the percentage was 41 with a production of 26.20 thousand CKM. In 1988-89, production was only 24.40 thousand CKM. Though over capacity may be cited as the reason for such a low capacity utilisation, the industry is banking on the enhanced power generation targets during the Eighth and Ninth Plan periods to boost demand for cables as also the upcoming core sector projects in petrochemicals, fertilisers and steel to offer a helping hand by way of demand upsurge.

As far as telecom cables are concerned, India is far from being self-sufficient in her needs. During 1988-89 the demand was 13 million CKM. As against this, our capacity was only five million CKM with imports bridging the gap. While production of dry core jelly filled cables has increased by 340 per cent from 8.32 lakh CKM in 1980 to 36.60 lakh CKM in 1986, the demand for telecom is expected to increase at a rate of 25 per cent per annum.

The projections made by the Department of Telecommunications indicate that about 790 lakh CKM of cables would be required during the Eighth Plan. This demand is estimated to go up to 1250 lakh CKM during the Ninth Plan. So the demand for jelly filled cables is going to increase substantially.

Power

The fortunes of the electric and electrical goods manufacturing industry are linked to those of the power sector. Over 70 per cent of the heavy electrical equipments produced is directly sold to Government and semi-Government agencies and state electricity boards. The sale of several other categories of equipment is directly dependent on the implementation of electrification projects.

The various five year plans over the years have given priority status to power generation. Despite this, demand for power has always outstripped supplies. The growth in installed capacity from 1362 MW (1949) to about 6400 MW (1990) has only been parallel to the even greater growth in demand over these forty years. The investment of Rs.393.00 crores during the First Plan period looks abysmal compared to the investment of Rs.34,273.00 crores during the Seventh Plan.[5] An average of 19 per cent of the total public sector outlays has been spent on the power sector over the years. Despite this, the peak demand shortage in the country during 1990 is expected to be about 9380 MW. In percentage terms, this works out to be 20 per cent.

The Eighth Plan power programme has been formulated keeping in view the long-term power demand for the period up to 1999-2000. Initially, a capacity addition of 48,000 MW had been proposed but keeping in view the resource constraint and the existing status of the projects a programme of capacity addition of about 38,369 MW has been proposed by the working group on power set-up by the Planning Commission to increase the installed generating capacity in the country to about 1,03,000 MW by March 1995.[6] The schemes corresponding to this programme have been identified. This capacity addition would comprise thermal (22,486 MW), gas (7,774 MW), hydro (7,433 MW), and atomic energy (705 MW).

The ongoing and sanctioned schemes would contribute about 26,460 MW towards this programme. About 10,549 MW could come from schemes which have already been cleared by CLA and are awaiting approval. The balance (1,360 MW) would come from new schemes.

The hydel and thermal power generation during 1984-85 was 156.80 billion KWH (hydel 53.90 billion KWH, thermal 102.90 billion KWH) and it reached 220.90 billion KWH (hydel 57.70 billion KWH, thermal 163.20 billion KWH) during 1988-89, i.e., 40.80 per cent increase (Table 3.4).

Table 3.4

Power Generation Trends

(Billion KWH)

Year	Hydel	Thermal	Total
1984-85	53.90	102.90	156.80
1985-86	51.00	119.30	170.30
1986-87	53.90	133.90	187.80
1987-88	47.40	154.50	201.90
1988-89	57.70	163.20	220.90

Source: Kothari's Year Book, 1991: p.A-103.

Lightings

The lamp industry produces the whole range of lighting products. Apart from the traditional GLS (General Light Service) lamps or bulbs, the other products in this range are fluorescent tubes, mercury sodium vapour and quartz tungsten halogen lamps. Special purpose lamps include projection, photographic, aviation, locohead and spotlighting lamps. Lamps are also made for printing industry, for surgical application, communication industry and even for therapeutic purposes. In fact in 1988-89, the Government designated the manufacture of decorative lamps as a new industry.

Energy efficiency of electric lamps is of considerable national importance because as much as 17 per cent of power consumption in the country is in the lighting sector.[7]

In view of this fact, the Industry Ministry has identified the lamp industry for special attention with regard to growth and modernization.

In lamp industry, the production of fluorescent tube lamps shows an upward trend compared to that of GLS Lamps. The production of GLS Lamps during 1984-85 was 277 million and it decreased to 250 million during 1988-89, i.e., 9.70 per cent decrease. But the production of fluorescent tube lamps during 1984-85 was 40.40 million and it increased to 50 million, i.e., 23.70 per cent increase (Table 3.5).

Table 3.5

Production Trends in the Lamp Industry

Year	GLS Lamps		Fluorescent Tube Lamps	
	Installed	Annual Production	Installed	Annual Production
1984-85	328	277	46.20	40.40
1985-86	343	269	41.90	40.70
1986-87	343	284	41.90	47.00
1987-88	343	256	46.20	45.70
1988-89	343	250	46.20	50.00

Source: Kothari's Year Book, 1991, p.A-102.

The production target of the Electric Power Equipments and most of the Electrical Components and Consumer Durables during 1989-90 was much higher than that of the actual production during 1984-85 (Table 3.6).

Table 3.6

Production Target for Selected Electrical Goods

Item	Unit	1984-85 (Actual)			1989-90 (Target)		
		Capacity	Production	Capacity Utilisation per cent	Capacity	Production	Capacity Utilisation per cent
Electric Power Equipment							
Steam turbines	MKW	4.50	2.90	64.40	4.50	3.70	82.20
Hydro turbines	MKW	1.30	1.30	100.00	1.70	1.40	82.40
Transformers	MKVA	39.40	25.40	64.50	40.00	32.00	80.00
Electric motors	MHP	7.90	4.90	62.00	8.50	6.50	76.50
Electric Components and Consumer Durables							
ACSR & AA conductors	'000 tonnes	150.00	53.00	35.30	150.00	50.00	33.30
PVC & VIR Cables Mill (Org. Sector)	Mill Metres	1310.00	534.00	40.80	1330.00	700.00	52.60
Dry cells	Milnos	1624.00	1148.00	70.70	1800.00	1400.00	77.80
Storage batteries	Milnos	2.90	2.00	69.00	4.00	2.80	70.00
HT insulators	'000 tonnes	45.00	32.00	71.10	60.00	45.00	75.00
Domestic refrigerators	'000 nos.	550.00	572.00	104.00	1000.00	900.00	90.00
Welding electrodes	MRM	800.00	690.00	86.30	1200.00	1000.00	83.30
Electric fans	Milnos	4.08	4.80	117.60	7.00	6.50	92.50

Source: Kothari's Year Book, 1991: p.A-102.

Table 3.7 shows the list of various electrical industrial units in India, both in the private and public sector, and their year of incorporation, registered office and authorised capital.

Table 3.7

List of Various Electrical Industrial Units in India

Sl. No.	Name of the Company	Year of Incorporation	Registered Office	Authorised Capital (Amount in Rs.)
	Batteries			
1.	Chloride Industries Ltd.	1947	Exide House, Calcutta	25,00,00,000.00
2.	High Energy Batteries (India) Ltd.	1961	Orini House, Perungudi Madras	2,00,00,000.00
3.	Nicco Batteries Ltd.	1984	Ghaziabad, Uttar Pradesh	4,60,00,000.00
4.	Standard Batteries Ltd.	1945	Santa Cruz, East Bombay	5,00,00,000.00
5.	UB-MEC Batteries Ltd.	1946	Yeswanthpur, Bangalore	1,22,50,000.00
6.	Willard India Ltd.	1973	Bulandshah, Uttar Pradesh	5,00,00,000.00
	Cables and Wires			
7.	Asian Cables Corporation Ltd.	1959	Dorli, Bombay	5,00,00,000.00
8.	Cable Corporation of India Ltd.	1957	Dorli, Bombay	15,00,00,000.00
9.	Deepak Insulated Cable Corporation Ltd.	1963	Bangalore, Tumkur Road, Nagasandra	2,00,00,000.00
10.	Delton Cables Ltd.	1964	Daryaganj, New Delhi	3,00,00,000.00
11.	Devidayal Electronics Wires Ltd.	1953	Gupta Mills, East Bombay	1,50,00,000.00
12.	Finolex Cables Ltd.	1967	Pimpri, Pune	10,00,00,000.00
13.	Gangappa Industries Ltd.	1965	Uppal Road, Hyderabad	2,20,00,000.00
14.	Hindustan Transmission Products Ltd.	1934	Vihar Road, Bombay	10,00,00,000.00
15.	Incab Industries Ltd.	1920	Hare Street, Calcutta	10,00,00,000.00

16.	Industrial Cables India Ltd.	1955	Patiala, Punjab	4,50,00,000.00
17.	Jay Electric Wire Corporation Ltd.	1974	New Marine Lines, Bombay	---
18.	Karnataka Tele Cables Ltd.	1982	Balavadi, Mysore	5,00,00,000.00
19.	(The) National Insulated Cable Company of India Ltd.	1942	Hare Street, Calcutta	2,90,00,000.00
20.	Premier Cable Company Ltd.	1962	M.G. Road, Ernakulam, Kerala	2,50,00,000.00
21.	Sterlite Industries (India) Ltd.	1975	Nariman Point, Bombay	5,00,00,000.00
22.	Telelink Nicco Ltd.	1983	Hare Street, Calcutta	8,00,00,000.00
23.	Universal Cables Ltd.	1945	Satna, Madhya Pradesh	20,00,00,000.00
24.	Upcom Cables Ltd.	1984	Lucknow, Uttar Pradesh	1,20,00,00,000.00
25.	Usha Beltron Ltd.	1986	Ranchi, Bihar	10,00,00,000.00
26.	Victor Cables Ltd.	1980	Faridabad, Haryana	2,50,00,000.00
27.	Vindhya Telelinks Ltd.	1983	Rewa, Madhya Pradesh	5,00,00,000.00
28.	Wandleside National Conductors Ltd.	1960	Ballard Estate, Bombay	50,00,000.00
29.	Traco Cable Company Ltd.	1960	Panampilli Nagar, Cochin	8,00,00,000.00
	Dry Cells			
30.	Geep Industrial Syndicate Ltd.	1948	South Road, Allahabad	1,50,00,000.00
31.	Indo National Ltd.	1972	Mount Road, Madras	1,25,00,000.00
32.	Lakhanpal National Ltd.	1972	Baroda, Gujarat	5,00,00,000.00
33.	Punjab Anand Batteries Ltd.	1972	Ropar, Punjab	1,50,00,000.00
34.	Toshiba Anand Batteries Ltd.	1971	M.G. Road, Ernakulam, Kerala	2,00,00,000.00
35.	United Carbide India Ltd.	1934	Middleton Street, Calcutta	40,00,00,000.00
	Fans			
36.	(The) Jay Engineering Works Ltd.	1935	Kasturba Gandhi Marg, New Delhi	5,00,00,000.00
37.	Goa Electricals and Fans Ltd.	1985	Ponda, Goa	1,50,00,000.00
38.	Kedia Electricals Ltd.	1970	Bala Nagar, Hyderabad	1,50,00,000.00
39.	Khaitan Electricals Ltd.	1981	J.L. Nehru Road, Calcutta	5,00,00,000.00
40.	Khaitan Fans (India) Ltd.	1984	J.L. Nehru Road, Calcutta	2,00,00,000.00

41.	Khaitan Tibrewala Electricals Ltd.	1975	Bala Nagar, Hyderabad	5,00,00,000.00
42.	Polar Electricals Ltd.	1982	Civil Lines, Delhi	1,50,00,000.00
43.	Polar Fan Industries Ltd.	1978	Brahmo Samaj Road, Calcutta	3,00,00,000.00
44.	Polar Industries Ltd.	1982	Park Street, Calcutta	3,50,00,000.00
45.	Ravi Air-cools Ltd.	1974	Varanasi, Uttar Pradesh	1,25,00,000.00
46.	Sam Electro Mechanical Industries Ltd.	1983	Udyog Nagar, Kanpur	1,00,00,000.00
	Lightings			
47.	Ajay Electrical Industries Ltd.	1971	A-1 Karam, Para, New Delhi	2,00,00,000.00
48.	Genelec Ltd.	1957	Ballard Estate, Bombay	2,50,00,000.00
49.	Hyderabad Lamps Ltd.	1981	Park Lane Secunderabad, Andhra Pradesh	3,00,00,000.00
50.	Lumax Industries Ltd.	1981	Gokhale Market, Delhi	3,00,00,000.00
51.	(The) Mysore Lamp Works Ltd.	1936	Malleswaram West, Bangalore	2,00,00,000.00
52.	Punjab Anand Lamp Industries Ltd.	1983	Ropar District, Punjab	12,00,00,000.00
53.	Sylvania and Laxman Ltd.	1962	Najafgarh Road, New Delhi	5,00,00,000.00
54.	Webfil Ltd.	1979	Rajendra Prasad Sarani, Calcutta	3,00,00,000.00
	Motors			
55.	Asea Brown Baveri Ltd.	1949	Dr. Annie Besant Road, Bombay	25,00,00,000.00
56.	Best and Crompton Engineering Ltd.	1911	Anna Salai, Madras	10,00,00,000.00
57.	Bharat Bijlee Ltd.	1946	Prabhadevi, Bombay	2,00,00,000.00
58.	Crompton Greaves Ltd.	1937	Gandhi Marg, Bombay	20,00,00,000.00
59.	DLF Universal Ltd.	1963	Faridabad, Haryana	5,00,00,000.00
60.	General Electric Company of India Ltd.		Chittaranjan Avenue, Calcutta	30,00,00,000.00
61.	Jyoti Electric Motors Ltd.	1966	Kheda District, Gujarat	50,00,000.00
62.	Kirloskar Electric Company Ltd.	1946	Rajaji Nagar, Bangalore	20,00,00,000.00
63.	Sahney Paris-Rhone Ltd.	1973	27 Kirol, Bombay	1,00,00,000.00
64.	Siemens Ltd.	1957	Worli, Bombay	25,00,00,000.00

	Power			
65.	(The) Ahmedabad Electricity Co. Ltd.	1913	Ahmedabad, Gujarat	30,00,00,000.00
66.	(The) Andhra Valley Power Supply Co. Ltd.	1916	Homi Mode Street, Bombay	16,20,00,000.00
67.	Anand Electric Supply Co. Ltd.	1936	Fort, Bombay	5,00,00,000.00
68.	Bombay Suburban Electric Supply Co. Ltd.	1929	Veer Nariman Road, Bombay	1,00,00,00,000.00
69.	GESL Ltd.	1978	Chowringhee-sgnore, Calcutta	26,50,00,000.00
70.	Dishergarth Power Supply Co. Ltd.	1919	Rajendra Prasad Sarani, Calcutta	1,24,00,000.00
71.	(The) Sarat Electricity Co. Ltd.	1920	Station Road, Surat	2,00,00,000.00
72.	(The) Tata Hydra-Electric Power Supply Co. Ltd.	1910	24, Homi Mody Street, Bombay	10,80,00,000.00
73.	Thana Electric Supply Co. Ltd.	1928	Ballard Estate, Bombay	2,00,00,000.00
74.	(The) Tata Power Co. Ltd.	1919	24, Homi Mody Street, Bombay	27,00,00,000.00
	Others			
75.	(The) Aluminium Industries Ltd.	1946	Kundara, Kerala	12,50,00,000.00
76.	Andhra Mechanical and Electrical Industries Ltd.	1967	Secunderabad, Andhra Pradesh	1,00,00,000.00
77.	Bajaj Electricals Ltd.	1938	Veer Nariman Road, Bombay	2,00,00,000.00
78.	Baroda Electric Metres Ltd.	1961	Kheda District, Gujarat	1,00,00,000.00
79.	ECE Industries Ltd.	1945	Kasturba Gandhi Marg, New Delhi	15,00,00,000.00
80.	Eastern Circuits Ltd.	1984	Area Colony, Bhopal	3,00,00,000.00
81.	EMA India Ltd.	1971	Udyoga Nagar, Kanpur	2,00,00,000.00
82.	Easun Reyrolla Relays and Devices Ltd.	1974	Alwarpet, Madras	1,00,00,000.00
83.	Eddy Current Controls (India) Ltd.	1971	Chalakudy, Kerala	1,00,00,000.00
84.	Electra (India) Ltd.	1971	Meerut, Uttar Pradesh	3,00,00,000.00
85.	Electra (Jaipur) Ltd.	1972	Victoria Park, Meerut	1,00,00,000.00
86.	Electric Control Gear (India) Ltd.	1978	Rakhial Road, Ahemedabad	1,00,00,000.00
87.	Electrical Manufacturing Company Ltd.	1953	136, Jessore Road, Calcutta	2,00,00,000.00
88.	Elpro International Ltd.	1962	Ballard Estate, Bombay	2,00,00,000.00
89.	Emco Transformers Ltd.	1964	Nariman Point, Bombay	75,00,000.00

90.	(The) English Electric Company of India Ltd.	1957	Netaji Subhas Road, Calcutta	10,00,00,000.00
91.	Hind Rectifiers Ltd.	1958	Lake Road, Bhanday Bombay	1,00,00,000.00
92.	India Meters Ltd.	1963	158, Greams Road, Madras	2,15,00,000.00
93.	Jyothi Ltd.	1943	Industrial Area, Nadodara	6,00,00,000.00
94.	Jyothi Structures Ltd.	1974	Bandra East, Bombay	2,00,00,000.00
95.	KLK Electrical Industries Ltd.	1980	Ambathur Industrial Estate, Madras	2,00,00,000.00
96.	Khatau Jumber Ltd.	1964	Mahim, Bombay	1,00,00,000.00
97.	Kirloskar Systems Ltd.	1962	Bangalore	1,00,00,000.00
98.	Lakshmi Electrical Control Systems Ltd.	1981	Avanashi Road, Coimbatore	5,20,00,000.00
99.	Modern Insulators Ltd.	1982	Moti Dungari Road, Jaipur	9,00,00,000.00
100.	Nicco Orissa Ltd.	1979	Mayur Bary, Orissa	8,00,00,000.00
101.	O.E.N. Connectors Ltd.	1981	Vyttilla, Cochin	3,00,00,000.00
102.	Permanent Magnets Ltd.	1960	Raopura, Baroda	1,00,00,000.00
103.	Pansami India Ltd.	1984	Banipan, Jaipur	10,00,00,000.00
104.	SSB Industries Ltd.	1975	Anna Salai, Madras	1,50,00,000.00
105.	SLS Power Switchgear Ltd.	1975	Porur, Madras	2,00,00,000.00
106.	Seshasayee Industries Ltd.	1957	Vadalur South, Arcot	5,00,00,000.00
107.	Shivalik Bimetal Controls Ltd.	1984	Solan District, Himachal Pradesh	1,00,00,000.00
108.	Southern Switch Gear Ltd.	1963	Ambathur Industrial Estate, Madras	1,00,00,000.00
109.	Stone India Ltd.	1931	Taratolla Road, Calcutta	2,50,00,000.00
110.	Transformers and Electricals Kerala Ltd.	1963	Ernakulam District, Kerala	15,00,00,000.00
111.	Tamus Electric Corporation Ltd.	1973	Rewa, Madhya Pradesh	1,00,00,000.00
112.	United Electrical Industries Ltd.	1950	Pallimukku, Quilon, Kerala	3,00,00,000.00
113.	Usha Rectifier Corporation of India Ltd.	1962	5, Parliament Street, New Delhi	3,00,00,00,000.00
114.	Vishal Electra-Mech (India) Ltd.	1986	New Marine Lines, Bombay	1,25,00,000.00
115.	W.S. Industries India Ltd.	1961	St. Thomas Mount, Madras	7,50,00,000.00
116.	Webel Sen Capacitors Ltd.	1981	Bidhan Nagar, Calcutta	1,50,00,000.00
117.	Kerala Electrical and Allied Engineering	1964	Panampilly Nagar, Cochin	15,00,00,000.00
118.	The Metropolitan Engineering Co. Ltd.	1945	West Tampannor, Trivandrum	40,00,000.00

Source: Kothari's Year Book, 1991: 58-66.

Industrial Profile of the State of Kerala

The State of Kerala failed to partake in the general buoyancy of the Indian economy during the first two five year plan periods. The pace of industrialisation of a region or a country depends upon factors such as the availability of local natural resources, development of infrastructure facilities, entrepreneurial skill, attitudes and industrial investment, level of skills etc. Though the State possesses certain basic requirements of industrial growth, it has yet to pick up momentum in the field of industrial development. Compared to many other states of India, Kerala has fairly developed overhead facilities. The agricultural sector is also fairly developed. But the industrial sector continues to be taidy and halting.

With the low rate of growth of the regional economy, there have not been opportunities for the creation of productive employment on a large-scale. Unemployed labour problem erodes living standards. The state produces very few of the goods that it consumes. On the whole, the fragile production base has been constraining the sustenance of the positive achievements and the improvement in the living standard of the people.

The sectorial changes in the economy show a positive shift towards the secondary sector. Though stagnant in terms of its share in the total value added for the most part in the eighties, the secondary sector has shown substantial potential to grow as displayed by its growing share in the total income (Table 3.8). A closer scrutiny of the secondary sector shows that the impetus to growth has come from the industrial sector.

Table 3.8

Sectorial Contribution of Net Domestic Product of Kerala

(in per cent)

Sector	At Current Prices				At Constant Prices		
	1980-81	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Primary	39.17	35.76	32.38	31.34	39.08	36.81	36.55
Secondary	24.33	23.90	25.94	26.64	22.74	25.12	26.56
Territory	36.50	40.34	41.68	42.02	38.18	38.07	36.89
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: 1) Department of Economics and Statistics

2) Central Statistical Organisation.

National Income and State Income (New Series).

The sectorial distribution of the state income at current prices is given in Appendix 3.1 and at constant prices in Appendix 3.2.

The per capita income of the State of Kerala is significantly low when compared to the national average even though the relative gap has narrowed down marginally (Table 3.9). The per capita income is only about three-fourth of the national average.

As per the quick estimates, the state income in 1991-92 at constant prices (1980-81) is likely to go up by 7.13 per cent from Rs.5,104.00 crores in 1990-91. At current prices the income is estimated at Rs.12,808.00 crores in 1991-92 as against Rs.11,499.00 crores in 1990-91 registering a growth rate of 11.38 per cent. The per capita state income at constant prices in 1991-92 estimated at Rs.1,802.00 is higher by 5.63 per cent compared to the per capita income of Rs.1,706.00 estimated for the preceding year. At current prices the per capita income has registered a growth rate of 9.81 per cent from Rs.3,843.00 in 1990-91 to Rs.4,220.00 in 1991-92.

Table 3.9

Estimates of Total and Per Capita Income of Kerala and India

Item	1980-81	1989-90	Growth Rate %	1990-91 (Q)	Growth Rate %	1991-92 (A)	Growth Rate %
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
National Income (Rs. in crores)							
At current prices	1,10,675	3,51,850	14.00	4,16,349	18.33	N.A.	---
At constant prices	1,10,675	1,76,159	6.00	1,86,429	5.83	N.A.	---
State Income (Rs. in crores)							
At current prices	3,829	10,174	11.36	11,499	13.02	12,808	11.38
At constant prices	3,829	4,705	5.88	5,104	8.48	5,468	7.13
Per Capita National Income							
(Rs. in crores)							
At current prices	1,630	4,291	11.60	4,974	15.92	N.A.	---
At constant prices	1,630	2,148	3.80	2,227	3.68	N.A.	---
Per Capita State Income (Rs. in crores)							
At current prices	1,513	3,451	9.69	3,843	11.36	4,220	9.81
At constant prices	1,513	1,596	4.31	1,706	6.89	1,802	5.63

Note: 1) Constant prices refer to 1980-81 as base.

2) P - Provisional, Q - Quick Estimate, A - Anticipated, N.A. - Not Available.

Source: 1) Department of Economics and Statistics

2) Central Statistical Organisation; National Income and State Income (New Series).

The analysis of the recent ASI data (Table 3.10) does not show any significant change in the industrial base. It is also clear that Kerala lacks a balanced industrial base. The relative importance of some traditional industries like petroleum, ship building, electronics etc., has increased over a period of time. Still, major industries in Kerala are of a traditional variety and based on the region's natural resources. Hence it may be argued that the overall industrial base of the state is still characterised by concentration on food industries.[8]

The overall growth achievement of the State of Kerala is relatively poor compared to most of the other States.[9] She has been occupying a very low position, i.e., 14th among the different states in the matter of industrialisation explained in terms of value added (Table 3.11). The share in value added in Kerala is comparatively low and is below the national average. The implication is that agricultural sector alone cannot be expected to provide growth dynamism. An industrial base is needed to stimulate and sustain the growth process. It only can provide the base for diversifying the economic structure and developing forces of production within the region.

Table 3.10

Kerala's Industrial Base, 1985-86

	2 Digit NIC Groups	Percentage share in total factory employment	Value Added
20-21	Food products	30.06	8.78
22	Beverages, tobacco	7.76	3.00
23	Cotton textiles	7.75	5.08
24	Wool, silk, synthetic fibre	0.34	0.27
25	Textile products	2.66	3.68
26	Wood and wood products	5.36	1.57
28	Paper and paper products	3.80	5.38
29	Leather, fur, etc., products	0.05	0.02
30	Rubber, plastic etc.	3.67	11.41
31	Chemical and chemical products	7.26	15.35
32	Non-metal mineral products	6.56	3.97
33	Basic metal and alloys	1.88	2.69
34	Metal products	1.77	1.56
35	Machinery, machine tools	2.01	2.66
36	Electrical machinery etc.	4.20	6.05
37	Transport equipment etc.	2.03	2.33
38	Other manufacturing industry	0.85	0.86
40	Electricity	8.51	23.22
42	Water works	0.14	0.17
97	Repair services	3.11	1.90
		100.00	100.00

Source: Subrahmanian, K.K., "Development Paradox in Kerala: Analysis of Industrial Stagnation," EPW, Vol. XXV, No. 37, 1990: p.2,053.

Table 3.11

Growth of State Domestic Product (At 1970-71 Prices)

States	Share in value added (1980-81) (per cent)	1970-71 to 1980-81	1980-81 1985-86 per cent per annum
Maharashtra	13	5.40	3.10
Punjab	05	5.20	5.10
Haryana	03	4.90	5.10
Gujarat	07	4.70	1.10
Karnataka	06	4.00	3.10
Andhra Pradesh	08	3.30	4.10
Bihar	07	3.10	4.30
Uttar Pradesh	13	3.00	5.10
West Bengal	10	3.00	4.40
Orissa	03	2.80	1.20
Tamil Nadu	06	2.80	6.90
Rajasthan	04	2.60	7.80
Madhya Pradesh	06	1.90	6.00
Kerala	03	1.80	1.40
All India (National Accounts)		3.70	5.00

Note: Compound Growth Rates based on semilog trends.

Source: Ahluwalia and Srinivasan, "Income and Growth: A Regional Profile," Economic Times, 25 Feb. 1989: p.10.

Public Sector Electrical Industry in Kerala—A Profile

In Kerala, among the engineering industries the electrical industry has developed most significantly (Report of the High Level Committee, 1984). The importance of the electrical industry lies in the fact that it is a major input to the power generating sector. Since power is the prime requirement for industrial and agricultural growth, top priority has been given to generation, transmission and distribution of electricity in the state. Power generating plants have enormously increased in size with their accompanying economics of scale. The Rural Electrification Programmes initiated by the state with the formation of the Rural Electrification Corporation in 1969 have also contributed to the growth of the industry.

The product of this industrial group consists of both industrial equipments and consumer products. Industrial equipments are widely used for further production in all sectors, primary, secondary and tertiary. The products using electricity include household appliances, elevators, escalators, factory machinery, light bulbs, radio and television receivers (Jules Backman, 1960).

In Kerala the major industrial units manufacturing electrical components are in the public sector. They are:

(1) Kerala Electrical and Allied Engineering Company Limited (KEL).

(2) Transformers and Electricals Kerala Limited (TELK)

(3) Traco Cable Company Limited

(4) United Electrical Industries Limited (UEI)

(5) The Metropolitan Engineering Company Limited.

All the five units in the electrical sector together employ 3,521 persons that account for 2.10 per cent of the total employment in the state enterprises. The capital investment of Rs.10,569.68 lakhs accounts for 3.63 per cent of the total capital investment in the state enterprises of Kerala.[10]

(1) Kerala Electrical and Allied Engineering Company Limited (KEL)

KEL was incorporated on 05 June 1964 with the main objective of carrying on the business of electrical, mechanical and structural engineering and manufacturing engineering equipments and fittings. It became a fully owned Government company in Aug. 1973. The authorised and paid-up capital of the company is Rs.1,500.00 lakhs and Rs.873.95 lakhs respectively (As per the Balance Sheet, 1994).

The management of the company is vested in a board of directors consisting of 11 directors including a managing director nominated by the Kerala State Industrial Enterprises Limited (KSIE). The managing director is the chief executive of the company.

The company has four units. They are located at Kundara, Mamala, Olavakot and Kasargod. Each unit is headed by a general manager. The unit at Kundara consists of Alternator and Foundry Divisions, Mamala unit consists of Transformer, Structural and Galvanising Divisions, Olavakot unit consists of Switchgear and Electrical Accessories Division and Kasargod unit consists of Brushless Alternators Project Division. Each division is headed by a production manager.

At present, the main products of the company consist of:

(a) Transformers

(b) HRC Fuses

(c) Relays/Contractors/Starters

(d) 18KW and 25KW Alternators

(e) Electrical Accessories, and

(f) Brushless Alternators.

Table 3.12 shows the company's production, capacity utilised and the installed capacity during 1989-90 and 1990-91.

Table 3.12

Production, Capacity Utilised and Installed Capacity of KEL During 1989-90 and 1990-91

Sl. No.	Name of Product	Unit	Installed Capacity		Production		Capacity Utilised (in percentage)	
			1989-90	1990-91	1989-90	1990-91	1989-90	1990-91
1.	Distribution Transformers	KVA	1,20,000	1,20,000	5,55,233	2,92,065	462.69	243.39
2.	C.I. Specials	MT	1,500	1,500	353	704	23.53	46.93
3.	Steel Structures	MT	1,200	1,200	479	620	39.92	54.67
4.	Galvanised Structures	MT	---	---	---	---	---	---
5.	Brushless Alternaters	Nos.	1,500	1,500	1,503	1,372	100.20	91.47
6.	HRC Fuses	Nos.	---	---	---	---	---	---
7.	Electrical Wiring Accessories	Nos.	1,33,000	1,33,000	4,35,244	5,67,122	327.25	426.41

Source: Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1992) p.120.

(2) Transformers and Electricals Kerala Limited (TELK)

TELK, a Government undertaking makes transformers for the production and distribution of electricity. It is a purely Government organisation, under the control of the Government of Kerala which started production in the year 1963. It started functioning with the technical and financial assistance from Hitachi Company, Japan.

The authorised capital of the company is Rs.15.00 crores and the paid-up capital at the end of Mar. 1994 stood at Rs.10.08 crores (as per the Balance Sheet of 1994). This is held by the Government of Kerala (Rs.7.69 crores), Hitachi Limited (Rs.1.04 crores) Kerala State Industrial Development Corporation Limited (Rs.0.49 crores), other financial institutions (Rs.0.49 crores) and public (Rs.0.37 crores).

The management of the company is vested in a board of directors. As on 31 Mar. 1994, the company had 12 directors (including the Chairman) of whom two were nominees of financial institutions.

The main divisions of TELK are:

(a) Transformers division, for the manufacture of transformers.

(b) Gas circuit breakers division, for the production of gas circuit breakers.

(c) Project engineering division, for the execution of projects on a turnkey basis.

(d) Marketing division headed by a deputy general manager.

At present, TELK has the following products:

(a) 400 KV transformer

(b) 600 MVA transformer

(c) 245 KV - SF6 gas circuit breakers

(d) 400 KV - SF6 gas circuit breakers

(e) 420 KV current transformer

(f) 420 KV oil integrated paper condenser bushing

(g) 144 MVA transformers

(h) 315 MVA 400 KV transformers for the National Thermal Power Corporation.

Table 3.13 shows the company's production, capacity utilised and the installed capacity during 1989-90 and 1990-91.

Table 3.13

Production, Capacity Utilised and Installed Capacity of TELK during 1989-90 and 1990-91

Sl. No.	Name of Product	Unit	Installed Capacity		Production		Capacity Utilised (in percentage)	
			1989-90	1990-91	1989-90	1990-91	1989-90	1990-91
1.	Power transformers	MVA	4,500	4,500	3,127	3,701	69.49	82.24
2.	Current and potential transformers	Nos.	1,000	1,000	646	569	64.60	56.90
3.	Gas circuit Breakers	Nos.	100	100	26	28	26.00	28.00
4.	Shunt reactors	MVAR	---	---	---	---	---	---

Source: Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1992) p.138.

The products of the company are mainly exported to Tanzania and Nepal. Its 400KV transformers are purchased by the State of Himachal Pradesh, Uttar Pradesh, Madhya Pradesh, Andhra Pradesh and Maharashtra State Electricity Boards. National Thermal Power Corporation is also a customer of TELK products.

TELK is not having enough orders for its products to run at full capacity. This has resulted in fall in production. The company has been running at a loss since 1981.

(3) **Traco Cable Company Limited**

Traco Cable Company Limited was incorporated on 05 Feb. 1960. Its Registered Office is at Panampilly Nagar, Cochin. The company has two units—one in Irimpanam, Ernakulam, and the other in Chumthra, Tiruvalla. It provides employment for 235 persons.

Traco is a public sector undertaking on a profit basis. The company's authorised and paid-up capital is Rs.800.00 lakhs and Rs.613.06 lakhs respectively (as per the Balance Sheet of 1994). Kerala Government is its major shareholder.

The company has two separate divisions, namely Power Cable Division and Telephone Cable Division.

Power cable division was established with the technical assistance of Keldy Engineering Company, Canada. PVC cable made out of copper and aluminium wires and metal cables without covering are its main products. These cables are mainly used by Railway and State Electricity Boards.

Telephone cable division was established with the technical assistance of Hindustan Cables, West Bengal. Indian Post and Telegraph Department is its major customer.

Table 3.14 shows the company's production, capacity utilised and the installed capacity during 1989-90 and 1990-91.

Table 3.14

Production, Capacity Utilised and Installed Capacity of Traco Cable Company Limited during 1989-90 and 1990-91

Sl. No.	Name of Product	Unit	Installed Capacity		Production		Capacity Utilised (in percentage)	
			1989-90	1990-91	1989-90	1990-91	1989-90	1990-91
1.	A.A.C. and A.C.S.R.	MT	1,500.00	1,500.00	1,307.00	1,409.00	87.13	93.93
2.	PVC covered conductors and bare copper conductors	MCM	39.92	32.92	24.24	10.73	60.72	32.59
3.	Telephone cable	CKM	5,00,000.00	5,00,000.00	---	26,000.00	---	5.20

Source: Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1992) p.134.

(4) United Electrical Industries Limited (UEI)

U.E.I. was incorporated in 1950 and commenced its activities with the assembly of single phase house service KWH metres. It has technical collaboration with M/s. Aron Engineering Company Limited, England.

Originally it was a public limited company, with substantial participation by the Government of Kerala and the Kerala State Industrial Development Corporation (KSIDC). Its management has been taken over by the Government since 1960. The company's authorised and paid-up capital is Rs.400.00 lakhs and Rs.379.07 lakhs respectively (as per the Balance Sheet of 1994).

United Electrical Industries Limited (UEI) is the first factory set-up in India for producing electricity metres. It started manufacturing of components and sub-assemblies after the setting up of a full-fledged machine shop. Now, the company is a full-fledged metre manufacturing unit. The company also developed its own design of poly phase metres and commenced its manufacture from 1965 with indigenous materials and components.

In 1962, a plan for diversification was initiated and manufacture of motor control gears was taken up with technical collaboration from M/s. Mysore Electrical Industries Limited. Now, it produces different types of motor control gears with various H.P. ratings. As a part of the diversification schemes, the company picked up manufacture of plastic film capacitors from 1975.

At present, the main products of the company consist of:

(a) Electricity metres

(b) Motor starters

(c) Plastic film capacitors

(d) Street light contractors.

Different types of electricity metres are:

(a) Single phase service metres up to 50 Amps

(b) Poly phase (three phase three wire) whole current up to 50 Amps at C.T. operated

(c) Poly phase metres (three phase four wire) whole current up to 50 Amps.

Different types of motor starters are:

(a) Oil immersed starters/delta starters for squirrel cage motors up to 40 H.P.

(b) Air break direct on-line push button starters up to 10 H.P.

(c) Oil immersed auto transformer starters for motors up to 40 H.P.

(d) Air break starters/delta starters up to 15 H.P.

(e) Oil immersed combined starter—rotor type starters for slip ring motors up to 40 H.P.

Table 3.15 shows the company's production, capacity utilised and the installed capacity during 1989-90 and 1990-91.

UEI was working under conditions of stress and strain with erratic market fluctuations and stiff competition between 1982 and 1987. The company's major dependency was on KWH metres and nearly 75 per cent of the employees were working on the production and sale of it. Owing to cutthroat competition in the metre market, the price of the metre was steadily falling down, whereas the prices of all raw materials and components were alarmingly on the increasing side. This peculiar phenomenon has thrown the metre industry out of gear.

Table 3.15

Production, Capacity Utilised and Installed Capacity of United Electrical Industries Limited (UEI) during 1989-90 and 1990-91

Sl. No.	Name of Product	Unit	Installed Capacity		Production		Capacity Utilised (in percentage)	
			1989-90	1990-91	1989-90	1990-91	1989-90	1990-91
1.	KWH Metres	Nos.	2,50,000.00	3,00,000.00	2,66,717.00	2,84,782.00	106.69	94.93
2.	Motor control gears	Nos.	4,500.00	4,500.00	1,996.00	1,991.00	37.69	44.24
3.	Plastic film capacitors	Million/ Nos.	15.00	15.00	0.95	0.27	6.33	1.80
4.	Carbon film resistors	Million/ Nos.	---	---	---	---	---	---
5.	L.T. switch gears	Nos.	---	---	---	---	---	---
6.	11 KV switch gears	Nos.	---	---	---	---	---	---

Source: Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1992) p.129.

The working capital started depleting resulting in an acute financial position. As a result, the company was finding it difficult to continue the normal activities. By the end of December, 1987, the accumulated loss had gone up to Rs.371.88 lakhs as against the paid-up capital of Rs.240.07 lakhs (as per the published accounts, 1987).

In order to revive and bring back the company, a plan of action with the assistance and co-operation of the Government was formulated. The State Electricity Board agreed to enter into a long-term arrangement for purchasing materials from the company at a reasonable rate for a period of four years with necessary price variation clause. The State Bank of Travancore (SBT) agreed to extend additional working capital of Rs.40,00,000.00. The State Electricity Board also allowed an advance of Rs.30,00,000.00 for supplementing the working capital. At present, the company is under the implementation of a rehabilitation scheme.

The company's action plan was continued with consistent monitoring of production activities for arranging supply of 22,000 single phase metres and 3,000 poly phase metres per month to the State Electricity Board under the long-term supply agreement.

This agreement with the State Electricity Board entered in the middle of 1988 expired on 30 June 1992. It was temporarily extended for another three months up to 30 Sept. 1992.

The market for motor control gears continues to be very competitive. Owing to problems in North India, the inflow of order did not show improvement in 1992 as anticipated. The production of carbon film resistor was discontinued. The machinery and parts of the project were sold out for Rs.9.00 lakhs during Sept. 1991 after obtaining approval from the Government and the consent of Kerala Financial Corporation. The sale amount was utilised for paying off the loan balance to the Corporation. The production of plastic film capacitors continued to be at a low level in view of the recessionary condition in electricity industry.

(5) The Metropolitan Engineering Company Limited

The Metropolitan Engineering Company Limited was incorporated on 25 Jan. 1945. Its Registered Office and factory is at West Thampannoor, Thiruvananthapuram. The company has 148 employees both in supervisory and non-supervisory posts. Table 3.16 shows the details of manpower as on 31 Mar. 1994:

Table 3.16

Manpower of Metropolitan Engineering Company Limited as on 31 Mar. 1994

Sl. No.	Manpower	No.	Average Emoluments (Rs. per month)
1.	Workers (all non-supervisory employees in factory, office and field)	127	1,453
2.	Supervisory staff (in factory, office and field)	16	1,797
3.	Executives	4	2,417
4.	Senior Executives (heads of department and above)	1	6,690
	Total	148	

Source: Government of Kerala, A Review of Public Enterprises in Kerala (Thiruvananthapuram: Bureau of Public Enterprises, 1993) p.123.

The company's authorised and paid-up capital is Rs.40.00 lakhs and Rs.33.17 lakhs respectively (as per the Balance Sheet, 1994). Its main products comprise:

(a) 11 KV to 220 KV isolators

(b) Fire extinguishers

(c) Current transformers.

Table 3.17 shows the company's production, capacity utilised and installed capacity during 1989-90 and 1990-91.

Table 3.17

Production, Capacity Utilised and Installed Capacity of

The Metropolitan Engineering Company Limited during 1989-90 and 1990-91

Sl. No.	Name of Product	Unit	Installed Capacity		Production		Capacity Utilised (in percentage)	
			1989-90	1990-91	1989-90	1990-91	1989-90	1990-91
1.	Switches and Fuses	Nos.	10,000	44,620	8,550	21,420	85.50	48.01

Source: Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1992) p.125.

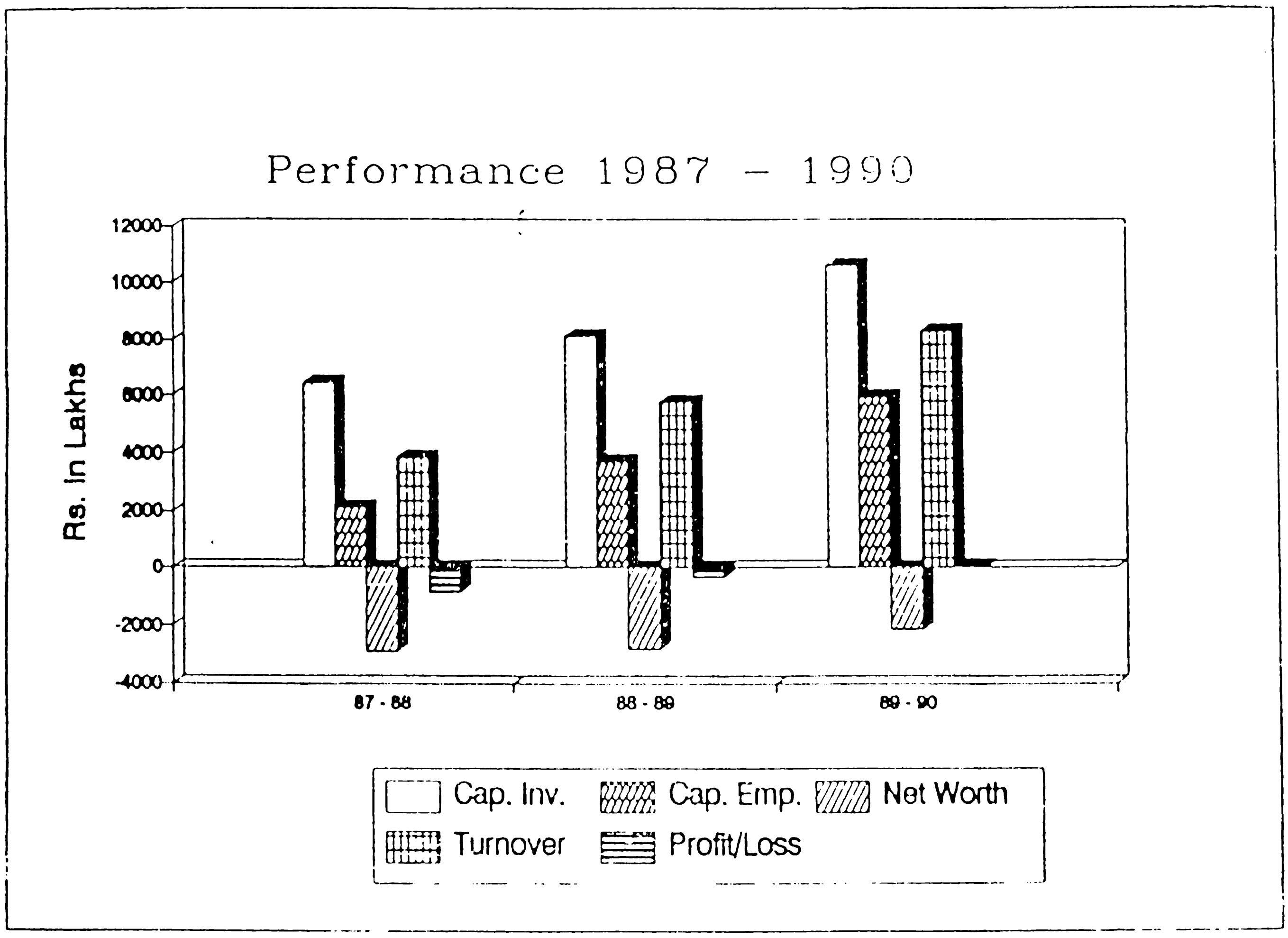
The performance of the company remained bad even in 1989-90. The amount of sales increased from Rs.99.01 lakhs (1988-89) to Rs.160.90 lakhs (1989-90). The loss for the year only marginally decreased from Rs.28.55 lakhs (1988-89) to Rs.26.01 lakhs (1989-90) in spite of turnover increase. This was mainly because of the increase of material consumption (as percentage of sales) from 60.81 per cent (1988-89) to 75.20 per cent (1989-90).

The working capital is still negative and more than five months sales is outstanding. The working capital management is to be improved in order to achieve better results. The negative working capital should be funded by working capital term loan and appropriate financial restructuring is required.

Performance of the Public Sector Electrical Industry in Kerala

The performance of public sector electrical industry in Kerala has not been attractive so far (Figure 3.1). The number of loss making units decreased from three (1988-89) to two (1989-90) and the number of profit making units increased from two (1988-89) to three (1989-90). The cash losses reduced from Rs.473.66 lakhs (1988-89) to Rs.26.00 lakhs (1989-90).[11]

Figure 3.1
Performance of the Public Sector Electrical Industry in Kerala -- 1987-1990



Source : Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, Mar. 1990) p. vi

None of the companies has declared any dividend so far and the overall net worth of the sector is still negative at Rs.(-)2,138.21 lakhs.

Conclusion

Electrical industry in India has witnessed tremendous technological progress in the last decade or so. Indian technology, whether imported or indigenously developed, has put India on the industrial map of the world.

Kerala's industrial sector has been quite sluggish. It has never fulfilled the role of catalyst of the economic development of the State. Lack of industrial dynamism is an important factor behind it. Unlike Bihar and Orissa, the State of Kerala has no natural resources which could be explored with advantage to set-up industries. Of late, the claims of availability of cheap power is also becoming doubtful. But its literate labour force is considered to be a very valuable asset for industrial development. So, it is possible to set-up industries which need skill and technology.

In Kerala, the electrical industry shouldered the responsibility of achieving self-sufficiency in electrical equipment essential for maintaining the tempo of power development programmes. Among the engineering industries, the development of electrical industry is very attractive. But at the same time most of the public sector electrical industrial units have been running at a loss for the last seven years on account of the absence of scientific inventory management.

Notes

[1] Vijay, L. Kelker, et. al., "Industrial Growth in the Eighties: Emerging Policy Issues," Economic and Political Weekly, Vol. XXV, No. 4, 1990: p.59.

[2] Kothari's Year Book, 1991: p.A-103.

[3] Pauchari, R.K., Energy and Economic Development in India (New York, London: Praeger Publishers, 1979) pp.167-173.

[4] Presentation and Studies, Monthly Commentary, Sept. 1991: p.IV.

[5] Kothari's Year Book, 1991: p.A-102.

[6] ibid.

[7] ibid.

[8] Subrahmanian, K.K., "Development Paradox in Kerala: Analysis of Industrial Stagnation", EPW, Vol. XXV, No. 37, 1990: p.2053.

[9] Ahluwalia and Srinivasan, "Income and Growth: A Regional Profile," Economic Times, 25 Feb. 1989: p.10.

[10] Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1990) p.XXIV.

[11] ibid., p.VI.

Chapter IV

Working Capital and Inventory

The profile of the public sector electrical undertakings in Kerala demands a study to ascertain their financial strength. Profitability and liquidity are the two dimensions which have to be considered while measuring the financial strength of an undertaking.[1] This chapter explains how inventory affects both profitability and liquidity consideration of the electrical undertakings run by the State of Kerala.

Industries require funds to carry out their various activities. Public sector electrical undertakings in Kerala are no exception to this. The total capital employed in an electrical undertaking can be divided into fixed assets and current assets. Gross current assets form the regular input in the business. These are converted into output which, on being sold, brings in money to the organisation. This is the money which circulates continuously in the organisation. The receipts obtained from sales are used to pay the suppliers' bills, salaries, wages and other expenses and this process continues as long as the organisation exists.

A refinement of the gross concept of working capital is the net concept. In this case the credit enjoyed by the organisation in the form of payables and other short-term borrowings is deducted from the gross figure. This represents the relatively liquid portion of the capital employed in the organisation from which the day-to-day business commitments are met.

The major constituents of current assets in the public sector electrical undertakings in Kerala are:

(1) Raw materials, components, stores items and spares, work-in-progress, finished goods.

(2) Cash on hand or in bank deposits, short-term investments, advances paid and receivables.

Current liabilities are made up of: borrowings from banks and deposits from the public which are short-term in nature, payable to creditors and suppliers and advances received against sales and statutory dues.

Tables 4.1, 4.2, 4.3 and 4.4 give information as to how the public sector electrical industry in Kerala managed its inventory and working capital from 1980-81 to 1989-90. These data have been taken from the Review of Public Enterprises in Kerala, Bureau of Public Enterprises, Government of Kerala. So far, the performances up to 1989-90 have been published. Commenting on the overall performance, it is noted that there is a high rate of inventory accumulation and a decline in the rate of bank borrowings.

Tables 4.5, 4.6, 4.7, 4.8, 4.9 and 4.10 are a broad spectrum showing how various public sector electrical undertakings in Kerala have managed their inventory and working capital from 1980-81 to 1989-90.

The level of working capital (Table 4.8) of Kerala Electrical and Allied Engineering Company Limited and Traco Cable Company Limited was very high up to 1986-87. This was brought down during 1988-89 and 1989-90, but not to a satisfactory level. The level of working capital of all other undertakings is a major source of concern. Current liabilities exceeded current assets during

1988-89 and 1989-90. Raw materials and other inventories were almost negligible (Table 4.5).

The material cost of electrical undertakings except KEL is very high averaging around 60 per cent and very nearly touching 80 per cent. The average inventory held (Table 4.6) is more than six months' consumption in all the undertakings. Inventory constitutes (Table 4.5) a substantial portion of the current assets in UEI where it is between 60 per cent and 70 per cent. In all other undertakings, inventory constitutes less than 40 per cent of the current assets. The average current ratio (Table 4.8) is 1.5:1, while KEL has a significantly higher figure, i.e., 3.3:1.

Inventories, material consumption, production, sales, current assets, current liabilities and short-term bank borrowings of the public sector electrical undertakings in Kerala from 1980-81 to 1989-90 are shown in appendixes 4.1, 4.2, 4.3, 4.4, 4.5, 4.6 and 4.7.

Table 4.1

Inventories as per cent of Current Assets, Consumption and Sales of the Public Sector Electrical Industry in Kerala from 1980-81 to 1989-90

Inventories as per cent of	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
Current Assets	48.09	47.84	42.25	40.65	44.27	44.16	36.34	41.70	40.06	42.27
Consumption	69.20	78.42	82.02	74.19	60.19	55.80	50.95	55.96	52.67	49.61
Sales	38.04	43.87	55.54	59.13	47.31	41.72	32.14	38.48	37.93	32.56

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Table 4.2

Current Ratio (Current Assets to Current Liabilities)

of the Public Sector Electrical Industry in Kerala from 1980-81 to 1989-90

	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
Current Ratio	2.63	2.97	1.99	1.73	1.31	1.71	1.59	1.93	1.03	1.13

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Table 4.3

Short-term Bank Borrowings as Percentage of Inventories

of the Public Sector Electrical Industry in Kerala from 1980-81 to 1989-90

1980-81	1981-82	1982-83	1963-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
149.71	133.24	182.66	230.99	271.26	90.41	122.87	137.57	121.34	105.49

Source: Government of Kerala, _Review of Public Enterprises in Kerala_ (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Table 4.4

Material Consumption as Percentage of Value of Production of the Public Sector Electrical Industry in Kerala from 1980-81 to 1989-90

1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
37.08	41.73	53.25	54.39	44.14	38.71	33.28	36.75	35.11	31.90

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Table 4.5

Inventories as per cent of Current Assets of the Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	48.79	48.25	36.06	40.49	37.94	33.32	30.85	38.11	37.29	33.70
2.	Traco Cable Company Limited	38.14	40.01	33.86	29.01	---	39.71	27.49	52.44	36.27	42.41
3.	Transformers and Electricals Kerala Limited	---	---	42.62	40.81	44.39	47.11	39.58	40.73	41.81	46.01
4.	United Electrical Industries Limited	68.48	57.53	70.97	72.95	76.26	69.84	63.99	69.07	58.81	59.57
5.	The Metropolitan Engineering Company Limited	60.48	63.84	65.57	---	---	46.44	31.87	20.69	16.68	27.95

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Table 4.6

Inventories as per cent of Consumption of the Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	91.33	95.56	91.02	120.34	95.68	46.75	43.67	67.10	50.09	36.61
2.	Traco Cable Company Limited	42.59	67.72	66.30	69.05	---	52.23	64.37	64.43	61.77	43.07
3.	Transformers and Electricals Kerala Limited	---	---	82.20	66.35	53.11	57.10	48.34	50.80	52.93	62.32
4.	United Electrical Industries Limited	131.80	61.87	80.26	79.85	84.84	76.61	89.48	75.06	55.80	31.42
5.	The Metropolitan Engineering Company Limited	63.38	86.18	136.77	---	---	159.14	119.46	40.89	30.16	27.95

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980 - 81 to 1989-90)

Table 4.7

Inventories as per cent of Sales of the Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	45.09	48.75	33.69	52.52	42.79	29.94	22.30	34.66	29.58	20.28
2.	Traco Cable Company Limited	32.26	44.61	38.80	47.08	---	36.59	44.24	45.12	41.47	33.96
3.	Transformers and Electricals Kerala Limited	---	---	72.04	56.86	48.20	47.64	34.33	39.21	44.20	44.84
4.	United Electrical Industries Limited	34.90	31.69	46.57	48.32	53.62	40.48	51.28	41.20	30.20	18.13
5.	The Metropolitan Engineering Company Limited	43.73	56.51	91.38	---	---	71.19	37.47	30.95	18.34	21.19

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Table 4.8

Current Ratio (Ratio of Current Assets to Current Liabilities)

of the Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	2.36	2.85	3.19	3.27	3.58	3.76	4.42	5.16	2.56	2.03
2.	Traco Cable Company Limited	2.67	2.64	3.01	3.48	---	2.83	5.01	2.30	2.33	2.42
3.	Transformers and Electricals Kerala Limited	---	---	1.64	1.35	1.06	1.34	1.02	1.59	0.80	0.92
4.	United Electrical Industries Limited	3.58	4.54	4.00	2.77	1.72	1.80	1.56	1.13	0.55	0.69
5.	The Metropolitan Engineering Company Limited	2.87	3.56	1.92	---	---	1.27	0.75	0.64	0.48	0.50

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Table 4.9

Short-term Bank Borrowings as Percentage of Inventories

of the Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	199.22	167.51	197.23	180.59	223.58	71.92	89.30	71.47	67.76	89.38
2.	Traco Cable Company Limited	89.95	74.60	61.28	---	---	---	48.86	73.65	64.25	53.99
3.	Transformers and Electricals Kerala Limited	---	---	206.72	296.74	278.30	95.40	137.95	157.80	140.59	112.88
4.	United Electrical Industries Limited	97.36	95.95	80.14	117.58	167.43	127.03	119.31	126.52	145.02	102.53
5.	The Metropolitan Engineering Company Limited	280.43	218.86	335.09	---	---	737.54	1673.39	4090.34	878.19	514.19

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Table 4.10

Material Consumption as a Percentage of Value of Production

of the Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	48.37	46.18	40.86	41.71	42.91	55.84	52.23	51.16	56.17	56.53
2.	Traco Cable Company Limited	75.18	65.13	59.53	70.69	---	70.22	69.95	70.92	65.02	76.47
3.	Transformers and Electricals Kerala Limited	---	---	77.16	86.73	83.47	77.55	85.14	71.74	74.65	68.26
4.	United Electrical Industries Limited	25.85	51.18	55.35	62.71	61.86	53.14	55.83	56.11	54.83	58.22
5.	The Metropolitan Engineering Company Limited	58.26	61.81	91.46	---	---	47.59	31.21	75.64	58.51	71.34

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Operating Cycle

The optimization of investment in working capital of a public sector electrical undertaking depends to a great extent on its operating cycle.[2] It measures the time gap between investment of cash and its realization out of sales revenue.

Operating cycle represents the period during which investments of one unit of money will remain blocked in the normal course of operation till recovery out of revenue.[3] The length of operating cycle differs from one electrical undertaking to another. Figure 4.1 shows the operating cycle of the United Electrical Industries Limited, Pallimukku, Kollam.

Figure 4.1

Operating Cycle of the

United Electrical Industries Limited, Pallimukku, Kollam

Cash → Raw Materials, Wages and Expenses → Work-in-progress → Finished Goods → Debtors → Cash

In UEI the operating cycle for element of cost starts with the purchase of materials. Materials are not consumed immediately. There involves 'Raw Materials Conversion Period'. Once materials are issued to production, it again involves a time gap between issue of materials and production of finished product. This time gap is called 'Work-in-Progress Conversion Period'. Finished goods are made by the company in the expectation of demand. Till the demand for finished product materializes, the product would remain in the store. This period is termed as 'Finished Goods Conversion Period'.

The company extends credit facilities to its customers due to competition and other reasons. This time gap between sale and realization of cash is known as 'Book Debt Conversion Period'.

The company receives credit in the purchase of raw materials from suppliers. This period is known as 'Payment Deferral Period' which reduces the length of operating cycle.

Thus the length of operating cycle of the public sector electrical industry (in case of direct raw materials) is the sum of:

(1) Raw Materials Conversion Period (RMCP)

(2) Work-in-Progress Conversion Period (WIPCP)

(3) Finished Goods Conversion Period (FGCP)

(4) Book Debts Conversion Period (BDCP)

The total of this period is sometimes referred to as Gross Operating Cycle. The Net Operating Cycle Period is ascertained by deducting from Gross Operating Cycle, the Payment Deferral Period (PDP)

$\therefore$ Gross Operating Cycle = RMCP + WIPCP + FGCP + BDCP

Net Operating Cycle = Gross Operating Cycle - PDP

$\therefore$ Net Operating Cycle = RMCP + WIPCP + FGCP + BDCP - PDP

The net operating cycle represents the net time gap between investment of cash and its recovery out of sales revenue. If depreciation is excluded from expenses in the computation of operating cycle, the net operating cycle also represents the cash conversion cycle. It is the net time interval between cash collections from sale of the product and cash payments for resources acquired by the firm.[4]

It is the task of the financial manager to manage the operating cycle effectively and efficiently. The length of operating cycle is the indicator of operating management performance. The shorter the operating cycle, the better would be the operating management performance. It can be employed to gauge the efficiency or inefficiency with which [illegible] credit collection, inventory management, personnel activities, etc., are planned and controlled. Failure to perform in any one of these functional areas of the business will increase the length of operating cycle, necessitating higher amount of working capital.

Besides efficient management of internal activities, the operating cycle calls for proper monitoring of external environment of the business. Changes in Government policies like taxation, import restrictions, credit policy of Central Bank, price trend, technological advancement etc., have their own impact on the length of operating cycle.

Computation of Various Periods

(1) Raw Materials Conversion Period (RMCP)

$$= \frac{\text{Average Inventory of Raw Materials}}{\text{Materials Cost per Day}}$$

Average Inventory

$$= \frac{\text{Opening Stock + Closing Stock}}{2}$$

Material Cost per Day

$$= \frac{\text{Total Materials Consumption}}{\text{Number of Working Days in a Year (Say 300)}}$$

(2) Work-in-Progress Conversion Period (WIPCP)

$$= \frac{\text{Average Inventory of Work-in-Progress}}{\text{Cost of Production per Day}}$$

Average Inventory of Work-in-Progress

$$= \frac{\text{Opening Stock + Closing Stock}}{2}$$

Cost of Production per Day

$$= \frac{\text{Total Cost of Production}}{300}$$

(3) Finished Goods Conversion Period (FGCP)

$$= \frac{\text{Average Inventory of Finished Goods}}{\text{Cost of Goods Sold per Day}}$$

Average Inventory

$$= \frac{\text{Opening Stock + Closing Stock}}{2}$$

Cost of Goods Sold per Day

$$= \frac{\text{Total Cost of Goods Sold}}{300}$$

(4) Book Debts Conversion Period (BDCP)

$$= \frac{\text{Average Debtors}}{\text{Cost of Sales per Day}}$$

Average Debtors

$$= \frac{\text{Opening Debtors + Closing Debtors}}{2}$$

Cost of Sales per Day

$$= \frac{\text{Total Cost of Sales}}{300}$$

(5) Payment Deferral Period (PDP).

$$= \frac{\text{Average Creditors}}{\text{Credit Purchases per Day}}$$

Average Creditors

$$= \frac{\text{Opening Creditors + Closing Creditors}}{2}$$

Credit Purchase per Day

$$= \frac{\text{Total Credit Purchases}}{300}$$

The Gross Operating Cycle (Table 4.11) of the public sector electrical industry in Kerala showed a diminishing trend from 1981-82 to 1989-90 except during 1983-84 and 1987-88. The increase of the gross operating cycle during 1983-84 and 1987-88 was on account of the steep rise of work-in-progress conversion period (Table 4.13) and the increase of book debts conversion period (Table 4.15). The raw materials conversion period (Table 4.12) always shows a declining trend, but the finished goods conversion period (Table 4.14) showed an increasing trend except during 1989-90.

The net operating cycle (Table 4.11) of the public sector electrical industry in Kerala showed an increasing trend up to 1984-85 and it became negative afterwards. It became negative from 1985-86 to 1989-90 on account of the decreasing trend of the payment deferral period (Table 4.16).

The gross operating cycle (Table 4.17) of the various public sector ~~sector~~ electrical undertakings in Kerala showed a diminishing trend from 1981-82 to 1989-90 except in the Traco Cable Company Limited during 1987-88 and 1988-89, in the Transformers and Electricals Kerala Limited, in the United Electrical Industries Limited during 1986-87 and in the Metropolitan Engineering Company Limited during 1987-88.

The increase of the gross operating cycle in the undertakings in the said periods was on account of the steep rise of work-in-progress conversion period (Table 4.20) and the increase of book debts conversion period (Table 4.22). The raw materials conversion period (Table 4.19) of the electrical undertakings showed a declining trend except in the United Electrical Industries Limited during 1986-87. But the finished goods conversion period (Table 4.14) showed an increasing trend except in the Traco Cable Company Limited and in the Metropolitan Engineering Company Limited.

The net operating cycle (Table 4.18) showed an increasing trend up to 1984-85 and became negative afterwards. It became negative from 1985-86 to 1989-90 on account of the decreasing trend of the payment deferral period (Table 4.23).

In the light of analysis of the operating cycle of public sector electrical industrial units in Kerala, it is found that inventory in the form of raw materials and stores, work-in-progress and finished goods contributed to more than 80 per cent of the total period of the operating cycle. It follows at once that with a given quantum of working capital, the turnover rate can be increased by reduction in any of the four components of the cycle. While credit availability and collection period depend on external market conditions, better inventory management at once leads to reduction of the time in the storage periods. Hence the performance of the organisation can be improved by better internal management itself.

Opening stock of materials, closing stock of materials, total material consumption, opening stock of work-in-progess, closing stock of work-in-progess, total cost of production, opening stock of finished goods, closing stock of finished goods, opening debtors, closing debtors, total cost of goods sold, opening creditors, closing creditors and total credit purchases of the public sector electrical undertakings in Kerala from 1981-82 to 1989-90 are shown in appendixes 4.8, 4.9, 4.10, 4.11, 4.12, 4.13, 4.14, 4.15, 4.16, 4.17, 4.18, 4.19, 4.20 and 4.21.

Table 4.11

Gross and Net Operating Cycle of the Public Sector Electrical Industry in Kerala from 1981-82 to 1989-90

(In number of days)

Sl. No.	Operating Cycle	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Gross Operating Cycle	307	267	344	89	213	261	312	230	191
2.	Net Operating Cycle	19	79	52	14	-102	-33	9	-304	-84

Gross Operating Cycle = RMCP + WIPCP + FGCP + BDCP

Net Operating Cycle = RMCP + WIPCP + FGCP + BDCP - PDP

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 4.12

Operating Cycle (RMCP) of the Public Sector Electrical Industry in Kerala from 1981-82 to 1989-90

Sl. No.	Operating Cycle	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Raw Materials Conversion Periods (RMCP) (in days)	163.00	116.00	140.00	112.00	67.00	85.00	81.00	53.00	55.00
2.	Average Inventory (Rs. in lakhs)	396.79	637.93	751.62	722.57	562.68	615.89	729.45	752.55	988.13
3.	Materials Cost per Day (Rs. in lakhs)	2.44	5.48	5.38	6.48	8.34	7.26	8.99	14.20	18.12

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 4.13

Operating Cycle (WIPCP) of the Public Sector Electrical Industry in Kerala from 1981-82 to 1989-90

Sl. No.	Operating Cycle	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Work-in-Progress Conversion Period (WIPCP) (in days)	12.00	19.00	31.00	21.00	14.00	26.00	91.00	70.00	27.00
2.	Average Inventory (Rs. in lakhs)	51.43	192.09	316.01	245.03	158.29	278.56	1146.69	1315.28	656.10
3.	Cost of Production per Day (Rs. in lakhs)	4.24	9.94	10.20	11.92	11.56	10.57	12.52	18.92	24.15

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 4.14

Operating Cycle (FGCP) of the Public Sector Electrical Industry in Kerala from 1981-82 to 1989-90

Sl. No.	Operating Cycle	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Finished Goods Conversion Period (FGCP) (in days)	27.00	32.00	35.00	40.00	45.00	49.00	39.00	27.00	24.00
2.	Average Inventory (Rs. in lakhs)	105.86	305.07	349.00	424.30	677.08	697.64	640.25	626.81	707.17
3.	Cost of Goods Sold per Day (Rs. in lakhs)	3.89	9.41	9.95	10.64	14.97	14.37	16.30	22.95	29.12

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 4.15

Operating Cycle (BDCP) of the Public Sector Electrical Industry in Kerala from 1981-82 to 1989-90

Sl. No.	Operating Cycle	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Book Debts Conversion Period (BDCP) (in days)	105.00	100.00	138.00	116.00	87.00	101.00	101.00	87.00	85.00
2.	Average Debtors (Rs. in lakhs)	407.90	941.47	1370.67	1234.88	1295.53	1453.62	1639.52	2007.63	2485.18
3.	Cost of Sales per Day (Rs. in lakhs)	3.89	9.41	9.95	10.64	14.97	14.37	16.30	22.95	29.12

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 4.16

Operating Cycle (PDP) of the Public Sector Electrical Industry in Kerala from 1981-82 to 1989-90

Sl. No.	Operating Cycle	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Payment Deferral Period (PDP) (in days)	288.00	188.00	292.00	275.00	315.00	294.00	303.00	537.00	275.00
2.	Average Creditors (Rs. in lakhs)	386.36	1004.08	1650.53	1861.47	1933.38	1875.67	1891.56	1300.48	803.00
3.	Credit Purchase per Day (Rs. in lakhs)	1.34	5.34	5.65	6.75	6.13	6.36	6.24	2.42	2.92

Source: Government of Kerala, <u>Review of Public Enterprises in Kerala</u> (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 4.17

Gross Operating Cycle of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(RMCP + WIPCP + FGCP + BDCP)

(In number of days)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	317	386	446	351	200	190	244	157	144
2.	Traco Cable Company Limited	348	369	360	---	115	424	1291	643	172
3.	Transformers and Electricals Kerala Limited	---	218	331	273	252	231	233	246	240
4.	United Electrical Industries Limited	204	232	220	147	144	267	225	153	110
5.	The Metropolitan Engineering Company Limited	434	669	---	---	383	1083	341	121	137

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 4.18

Net Operating Cycle of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(RMCP + WIPCP + FGCP + BDCP - PDP)

(In number of days)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	35	62	148	51	-94	-15	-66	-500	-98
2.	Traco Cable Company Limited	52	45	31	---	-38	314	976	-94	-89
3.	Transformers and Electricals Kerala Limited	---	68	44	8	-85	-63	-71	-278	-39
4.	United Electrical Industries Limited	101	42	-64	-113	-146	-4	-59	-979	-255
5.	The Metropolitan Engineering Company Limited	124	393	---	---	225	856	16	-122	-177

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 4.19

Raw Materials Conversion Period (RMCP)

of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(In number of days)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	138	179	202	157	69	60	99	57	47
2.	Traco Cable Company Limited	186	209	207	---	30	77	86	72	66
3.	Transformers and Electricals Kerala Limited	---	73	113	96	83	50	45	47	56
4.	United Electrical Industries Limited	138	153	158	85	90	200	172	113	67
5.	The Metropolitan Engineering Company Limited	285	540	---	---	326	987	241	34	31

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 4.20

Work-in-Progress Conversion Period (WIPCP)

of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(In number of days)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	25	27	24	21	14	11	11	13	12
2.	Traco Cable Company Limited	--	--	--	--	48	246	1106	490	22
3.	Transformers and Electricals Kerala Limited	--	22	38	21	9	1	33	56	44
4.	United Electrical Industries Limited	5	10	13	11	5	---	---	3	5
5.	The Metropolitan Engineering Company Limited	--	--	--	--	--	---	5	7	7

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 4.21

Finished Goods Conversion Period (FGCP)

of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(In number of days)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	35	33	34	36	33	33	34	24	18
2.	Traco Cable Company Limited	17	18	11	--	2	7	10	7	8
3.	Transformers and Electricals Kerala Limited	--	35	40	42	58	64	46	34	34
4.	United Electrical Industries Limited	13	22	25	24	22	26	23	13	8
5.	The Metropolitan Engineering Company Limited	73	64	--	--	--	--	1	1	9

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 4.22

Book Debts Conversion Period (BDCP) of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(In number of days)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	119	147	186	137	84	86	100	63	67
2.	Traco Cable Company Limited	145	142	142	---	35	94	89	74	76
3.	Transformers and Electricals Kerala Limited	---	88	140	114	102	116	109	109	106
4.	United Electrical Industries Limited	48	49	34	27	27	41	30	24	30
5.	The Metropolitan Engineering Company Limited	76	65	---	---	57	96	94	79	96

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 4.23

Payment Deferral Period (PDP) of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(In number of days)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	282	324	298	300	294	305	310	657	242
2.	Traco Cable Company Limited	296	324	329	---	153	110	315	737	251
3.	Transformers and Electricals Kerala Limited	---	150	287	265	337	294	304	524	279
4.	United Electrical Industries Limited	303	292	284	260	290	271	284	1132	355
5.	The Metropolitan Engineering Company Limited	310	276	---	---	158	277	325	243	314

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Liquidity Requirements

Operating cycle shows the number of times the working capital is turned over in a year. The endeavour of an aggressive management will be to reduce this period so that the same quantum of working capital can be turned over more number of times. But there are physical limits below which the cycle cannot be reduced. These periods will be fixed by market conditions for credit availability and collection periods and the technology for the operating cycle. Thus a minimum quantity of funds will be required for working capital. Liquidity requirements analyse whether this quantum of funds is sufficient to meet the reasonable requirements of the undertaking. This analysis can be made through the study of liquidity ratios.

Ratio Analysis

The current ratio and the acid test ratio (or quick ratio) indicate the short-term health of the public sector electrical undertakings in Kerala.

The current ratio gives the cover provided by the current assets to current liabilities. It is

$$\frac{\text{Current Assets}}{\text{Current Liabilities}}$$

If there is a liquidation, this figure gives an indication as to how best the current liabilities can be met by current assets. All the current assets cannot be liquidated at par in a short span of time. If this ratio is two, the short-term creditors represented by current liabilities are safe, even if there is only 50 per cent realization of the current assets of an undertaking on liquidation.

The acid test ratio is computed because the inventories cannot be liquidated easily. It is

$$\frac{\text{Quick assets}}{\text{Quick Liabilities}}$$

Inventories do not fall in the category of quick assets on account of the operating cycle requirements. This ratio gives a measure of the cover provided to current liabilities by assets which can be quickly converted into cash.

The norms of these two ratios depend on the type of undertakings. It is usual to expect the current ratio to be around two and the quick ratio to be around one. It is seen that the majority of the public sector electrical undertakings in Kerala have a current ratio around 1.5:1 (Table 4.8). It can, therefore, be inferred that as the quick ratio increases the credibility of the undertaking will also increase. This is because of the trade creditors will feel more secure about the amounts they have extended. As the value of quick ratio can be increased by decreasing the inventories, better inventory management increases credibility and liquidity.

Profitability and Inventory

Like other undertakings, the public sector electrical undertakings in Kerala also expect a return from their investment in inventories. It is a fact that every sale of rupee has a material content, labour content, overhead content, interest burden and profit. But the respective percentage of each item varies from product to product and organisation to organisation. While the labour and overheads can be considered as constant in the short-run of a year, the material content and the interest burden are variable. Hence price and profits depend more on the material content and the interest burden.

The material content affects both as cost of direct material consumed and the interest burden. The interest burden comprises two parts; the interest of the fixed capital and the interest of the working capital, the major constituent of which is inventory. Therefore, with better inventory control an electrical undertaking can reduce both the material cost and the interest burden, thereby increasing the profit.

For instance, where the material cost is 50 per cent, interest burden is 10 per cent, other costs are 30 per cent and the profit is 10 per cent of the sale price. It is assumed that over a certain time horizon the price remains constant. Then a 10 per cent decrease in material cost is equivalent to a 50 per cent increase in profitability and a 10 per cent decrease in interest burden is equivalent to a 10 per cent increase in profitability.

Assume a sale price of Rs.200/- per unit.

Thus, a new material cost is Rs.90/- and new profit is Rs.30/- per unit.

Increase in profit per cent due to the 10 per cent decrease in material cost is:

$$\frac{30 - 20}{20} \text{ or } 50 \text{ per cent}$$

Similarly, the previous burden is Rs.20/- and 10 per cent decrease in this gives an interest burden of Rs.18/-.

The new profit is therefore Rs.22/- and the increase in profitability is two out of 20 or 10 per cent. This calculation assumes that the remaining charges of 30 per cent do not change. This clearly brings out the importance of inventory control and the benefits it accrues in an undertaking.

Conclusion

The efficient and smooth production and distribution activities of the public sector electrical industrial units in Kerala depend upon adequate working capital. It is the duty of the financial manager to control working capital position at the optimum level by maximizing the profitability without impairing the liquidity of the concern. Setting the optimum level of working capital requires an exercise of determining the level of current assets where total cost is minimum. Out of various current assets, inventories constitute an average of 90 per cent of the working capital. Thus managing working capital is synonymous with controlling inventories.

Operating cycle concept determines the amount of working capital which has to be negotiated with commercial banks and others in the form of term loans, overdrafts/cash credit, discounting share capital, debt capital, etc.

Therefore, the length of operating cycle has a direct bearing on the amount of negotiated working capital. The longer the length of operating cycle, the larger will be the amount of negotiated working capital. Consequently efficiency lies in reducing the length of operating cycle.

Notes

[1] Gopalakrishnan, P. and Sandilya, M.S., Inventory Management: Text and Cases (Delhi: MacMillan India Limited, 1981) p.10.

[2] Hyderabad, R., "Concept of Operating Cycle and its Management," Management Accountant Vol. 29, No. 7, July 1994: pp.537-540.

[3] Babtosh Banerjee., Financial Policy and Management Accounting (Calcutta: World Press Private Limited, 1990) p.82.

[4] Pandey, I.M., Financial Management (New Delhi: Vikas Publishing House, 1991) p.80.

Chapter V

Some Concepts About Inventories

The study reveals that inventories account for 80 per cent or more of the working capital in most of the undertakings. Thus it influences a lot in determining the profitability and liquidity of the concern. For this it is essential to have a clear-cut idea about the various concepts of inventories which are as follows:

(1) Inventory—a major cost component

(2) Material—a fertile area for more research

(3) Material—a limiting factor

(4) Lead time influences on inventories

(5) Productivity of inventories.

Inventory—A Major Cost Component

An analysis of sales of the public sector electrical undertakings in Kerala during 1989-90 gives the following information:[1]

Direct material	-	60%
Labour	-	15%
Overheads and profit	-	25%
Total	-	100%

The above data show that direct materials and indirect materials forming part of the overhead cost, constituting inventories account for a large percentage of the total cost. Inventories, therefore, offer the most important and fruitful area of cost reduction and increased profits.

Inventory problem is one of balancing various costs so that the total cost should be minimized.[2] These costs are:

(a) cost of ordering

(b) cost of holding or carrying inventory

(c) understocking cost, and

(d) overstocking cost.

The cost of ordering opposes the cost of carrying while the understocking cost opposes overstocking cost. If these costs operate in the same direction, instead of behaving in opposition, there will be no inventory problem. The cost of ordering and the cost of carrying enable us to optimize on the number of orders and the quantity of inventory to be ordered. The understocking and overstocking costs help an industrial unit to determine the service level that has to be maintained by the inventory.

Cost of Ordering

An organisation can attain its need for materials only after fulfilling certain activities. These activities consume executive and non-executive time, stationery and communication charges, thus giving rise to the ordering cost. The cost of an imported order is much greater than that of a cash purchase from the market. This is on account of the variation in the level of activities for different ranges of items.

The ordering cost consists of the costs due to:[3]

(i) Stationery, typing and despatching of orders and reminders.

(ii) Advertisements, tender forms, tender opening formalities etc.

(iii) Follow-up for expediting. These will be the travel costs, telephone, telegrams and postal bills.

(iv) Costs incurred by the goods received bay, inspection and handling.

(v) Rent and depreciation on the space and equipments utilised by the concerned purchasing personnel.

(vi) Salaries and all statutory payments to the purchasing personnel.

(vii) Cost of source developments; and

(viii) Cost of entertaining suppliers.

Thus the average ordering cost is:

$$\frac{\text{Total costs incurred on all these heads during a year}}{\text{Number of orders in that year}}$$

In addition to the ordering cost, the set-up cost should also be taken into account while scheduling production in the public sector electrical undertakings in Kerala. It consists of idle time, cost of labour and tooling involved in the change of product from one to the other.

One of the major components of ordering costs in these undertakings is salaries.[4] This can be controlled if the number of men in purchasing is kept as low as possible. Hence, any jump in the total salary paid should not be allowed unless there is a corresponding increase in the number of orders. The use of overtime can be considered cheaper when there is a marginal increase in the number of orders.

Cost of Holding or Carrying Inventory

One of the motivating factors to control inventory arises on account of its carrying cost. It comes around 30 per cent of the total inventory cost in the public sector electrical undertakings in Kerala, i.e., if the annual average inventory is valued at Rs.100/-, then it will cost the concern Rs.30/- to carry it.[5]

Inventory carrying cost is usually expressed as a percentage of the average investment in inventory. Capital cost, cost of storage and handling and deterioration and obsolescence cost are its main components.

Capital costs are mainly represented by interest charges. The storage costs vary widely in accordance with the type of materials stored, type of storage facilities used and other factors. It consists of rent for storage facilities, salaries of personnel and related storage expenses. The total cost on account of deterioration, wastage, obsolescence etc., may well lie between 10 to 20 per cent of the average value of inventory in the public sector undertakings in Kerala.

Understocking Cost

It is the penalty incurred to the concern on account of the inability to meet a demand in time. The quantum of penalty depends on the nature of the demand. In cases where the demand is from a customer of the retail establishment, the shortage condition may result in a cost relatively small compared with the item cost. If, on the contrary, the demand arises in a manufacturing activity, the penalty cost for shortage may be extremely high relative to the cost of the item. This is because the entire manufacturing activity would necessarily have to wait for the item which is short.

Overstocking Cost

The overstocking cost arises on account of the opportunity lost when investment in inventories is postponed for a longer period than necessary. In the case of items which will ultimately be used, this cost can be equated with the carrying cost. For items which cannot be used after a certain period this cost will be the difference between the cost of the item and its salvage value.

As far as an organisation is concerned, the situation of both overstocking and understocking is not at all happy. Both shortages and surpluses are required to balance one against the other as they are costly. Arriving at the happy medium between too much and too little is the essence of inventory management.

Material—A Fertile Area for More Research

The material cost of a product constitutes the largest chunk of its cost. But its proportions vary from industry to industry and organisation to organisation. Thus materials seem to be the most potential area for cost minimization and profit maximization.

Material is cash in another form. It should have the same care and control as cash itself. It is one of the most fertile areas for more research. The principal contributing factors of material are:[6]

(a) cost factor

(b) investment factor

(c) leverage effect

(d) frequency of decision making

(e) flexibility

(f) easy handling

(g) choice factor

(h) focal point of decision making.

Cost Factor

The materials account for more than 50 to 60 per cent of total costs in the public sector electrical undertakings in Kerala. Hence the importance of materials can hardly be neglected. By controlling materials, the organisation will be controlling more than 60 per cent of their production costs.

In most of the industries, the material cost does not fall below 40 per cent and it is more than 65 per cent in the case of fabrication, transport industry and textile industry (Table 5.1).

Table 5.1

Extent of Material Cost in Various Industries

Material Cost	Industry
Above 65%	Fabrication, Earth moving equipment, Wool, Jute, Vehicles, Cotton yarn etc.
60% to 65%	Cotton textiles, Bread etc.
55% to 60%	Engineering and non-ferrous
50% to 55%	Ship building, Chemicals, Tyres, Machine tools, Cement, Electricity etc.
45% to 50%	Pharmaceuticals
40% to 45%	Steel, Newspapers and Fertilizer

% = per cent

Source: Speech delivered by Mr. C. Subramanian, Former Finance Minister in his address at the Coimbatore Branch of National Association of Materials Management, The Hindu, 11 Dec. 1974: p.10.

Investment Factor

The working capital of an undertaking will be unnecessarily blocked up when it stores more raw materials than required. Heavy inventories imply more storage costs, obsolescence and deterioration. It may also be lost due to theft which is difficult to make out.

The study conducted by the Reserve Bank of India on company finance relating to 1,650 medium and large-scale public limited companies reveals that the investment in inventories constitutes 37.20 per cent of total assets, 59 per cent of current assets and 90 per cent of total working capital requirements.[7] Thus a substantial amount of scarce capital gets locked up in the form of inventories resulting in various visible and invisible effects on the performance.

Many public sector electrical undertakings in Kerala are experiencing heavy and continuous losses due to overinvestment in inventory. Historically speaking corporate bodies held raw materials at the rate of seven to nine months' consumption during 1965-66, five to six months' consumption during 1974-75 and three months' consumption during 1980-81 which seem to be heavy from the view point of the profit position of the organisation.[8] There are cases where organisations have stored the inventory which is sufficient to cover six months' consumption. The organisation may give reasons like fear of scarcity or wide price fluctuations. But these may not be the genuine reasons.

Leverage Effect

Materials provide more scope to improve the profits if they are controlled scientifically than the area of labour or indirect expenses. In a sense, materials act as levers to improve the profits (Table 5.2).

Table 5.2

Change of Profit Under Different Situations

Particulars	Present Situation (costs when uncontrolled)	When only Materials Costs are Controlled	When only Labour Costs are Controlled	When only Overhead Costs are Controlled
Sales	1,00,000	1,00,000	1,00,000	1,00,000
Less:				
Material Cost	60,000	54,000	60,000	60,000
Labour Cost	20,000	20,000	18,000	20,000
Overhead Cost	10,000	10,000	10,000	9,000
Total Manufacturing Expenses	90,000	84,000	88,000	89,000
Profit	10,000	16,000	12,000	11,000
Increase in Profit	Nil	6,000	2,000	1,000

Assumptions:

(i) Material, labour and overhead costs are 60 per cent, 20 per cent and 10 per cent of sales value respectively under present situation.
(ii) Only 10 per cent of the costs can be brought down by controlling.
(iii) The management can effectively concentrate on only one area.

Source: Suresh, B.H., "Materials: A Potential Area for Improving Profits," The Management Accountant, Vol. 21, No. 4, Apr. 1986: p.210.

Table 5.2 shows that the profit is 10 per cent of the sales value before the control on the cost of material, labour and overhead is exercised. When labour cost and overheads are the target of control, the profits improve to Rs.12,000/- and Rs.11,000/- respectively representing an increase of profit by 20 per cent and 10 per cent respectively over the existing profit of Rs.10,000/-. But the profits would increase by 60 per cent when material costs are controlled. As a result, the leverage effect of material cost control is phenomenally higher than that of the labour cost and overhead cost control.

Frequency of Decision Making

Very often, the management has to take decisions regarding the quality, quantity, price and source of materials. This provides an opportunity to the management either to improve earlier decisions or to change decisions for the benefit of the organisation.

Flexibility of Volume

The market demand for any product does not remain the same forever. In case of sudden boost or unexpected slump for the product, the investment in materials can be adjusted to the market requirements.

Easy Handling

Materials can be better handled than labourers when the management wants to have more efficiency either by improving the method of production or by changing the materials themselves.[9]

Choice Factor

Materials offer many chances to the management to bring down the cost of manufacture. Sometimes, alternative materials are available at cheaper rates for manufacturing the same product without altering the quality of the product. If necessary, an organisation can bring down the cost either by changing materials or by altering methods and varying ratios.

Focal Point of Decision Making

Whatever may be the decision of the management, it will directly or indirectly affect materials. It is material that is purchased to be processed, moved from one department to another and sold to customers as finished goods. Hence any decision that is taken will affect materials directly or indirectly and any decision on materials will ultimately affect the organisation directly or indirectly.

Even though the omnipresence of material is an advantage for management, from the view point of directing the attention, it is equally a tough job to direct the control on material at every point. Therefore, materials can only be controlled by pointing out the important areas where the possibility of loss is more.[10]

There are plethora of techniques decided and applied in the area of material control. These techniques have spread over all the key areas of inventory management. They range from planning of raw materials to despatching of finished goods to the consumers.

Material—A Limiting Factor

On account of the influence of limiting or key factors like sales, materials, plant capacity, capital etc., an organisation is prevented from producing as many units of the selected products as it would like to. First of all an organisation, therefore, should assess the extent of influence of these factors in order to ensure maximum profitability. When both contribution and key factor are known, the relative profitability of different products or processes can be assessed with the help of the following formula:

$$\text{Profitability} = \frac{\text{Contribution}}{\text{Key Factor}}$$

Example: When material is in short supply

$$\text{Profitability} = \frac{\text{Contribution per unit}}{\text{Material required per unit}}$$

Quite conceivably, situations may arise when material becomes the limiting factor. Under these circumstances profit can be bettered by reallocating of resources. In other words, materials should be diverted to more profitable channels, thereby increasing total profits. A simple optimization model is worked out here.

Product	x	y
Selling price per unit	16	12
Variable cost	8	4
Contribution per unit	8	8
Material required per unit	800 gram	500 gram
Contribution per kg. of material	10	10

If it is assumed that 2000 kg. of materials are available, production cannot be lowered below 400 units for each product and fixed cost is Rs.10,000/-, then the position becomes:

Proposal I

'X' 400 units x 0.8 kg. (Contribution per kg.)	=	320 kg. x Rs.10/-	=	3,200
'Y' 3360 units x 0.5 kg.	=	1,680 kg. x Rs.16/-	=	26,880
		2,000 kg.		
Total Contribution			=	30,080
Fixed Cost			=	10,000
Net Profit				20,080

Proposal II

'Y' 400 units x 0.5 kg. (Contribution per kg.)	=	200 kg. x Rs.16/-	=	3,200
'X' 2250 units x 0.8 kg.	=	1,800 kg. x Rs.10/-	=	19,000
		2,000 kg.		
Total Contribution			=	21,200
Fixed Cost			=	10,000
Net Profit				11,200

From the above illustration, it is quite clear that product 'Y' is more profitable than product 'X'. In the case of the operation of a key factor, the best position is reached when contribution per unit of key factor is maximum.

Lead Time Influences on Inventories

There is a direct relationship between lead time and inventories. During lead time there will be no delivery of materials and the consuming departments will have to be served from the inventories held. Both lead time and consumption rate can increase without notice and the inventories will have to be geared up for this contingency. Inventories have to take care of normal consumption during both average lead time and abnormal lead time. Therefore, as lead time increases the inventories will have to increase correspondingly.

The various types of lead time influences in inventory decisions are:[11]

(a) administrative lead time

(b) manufacturing lead time

(c) transporting lead time, and

(d) inspection lead time.

Administrative lead time arises on account of the activities like identification of needs and follow-up orders. In the identification stage the planning section has to compute the requirements of various materials over a time horizon. The actual computing time may be only around half an hour, but the planning department may take two to three weeks to raise an indent. This increase will be due to the waiting time for discussions, meetings, approvals and signatures, especially so in the case of new materials.

An average time required in the public sector electrical undertakings in Kerala to convert an indent to an order is about two and a half months for new items.[12] First of all locate the source and then negotiate the terms and conditions of supply. Once the negotiations are complete, the order can be placed. For imported items formalities such as DGTD clearance, FE clearance, import licence and raising a letter of credit should also be undertaken, thus, leading to an increase in the lead time.

The manufacturing lead time depends entirely on the supplier. Once the order is placed, the purchaser has to wait till the supplier delivers the goods.

The transporting lead time depends on the mode of transport. The time consuming formalities such as insurance, sales tax forms and retiring of documents are involved in it. Customs formalities will add to the lead time requirements for imported items as the transshipment is to be made at the port itself.

Inspection lead time arises on account of the non-availability of the standard to compare the quality of the received item. In the case of special equipment, the indenter may himself depute the inspection personnel, which naturally increases the lead time. A pertinent factor which has to be taken note of is that, if an item is rejected during inspection, the lead time will be increased by the time taken to supply the replacement.

Of the various components of lead time, the procurement or manufacturing lead time is the toughest nut to crack. This should be taken care of while negotiating the order and supply details. The administrative and inspection lead time are under the control of the purchaser. The transportation lead time can be reduced by a cost trade off but not below the threshold.

Productivity of Inventories

Most companies set profit goals but few set productivity goals. "In a growing economy everyone—labour, management and consumer—wins when productivity expands." Growth in productivity can bring tremendous benefits to the economy. It has always been the historic strength of the private sector. An improvement of one per cent in output per employee would increase the gross national product by crores of rupees.

The productivity aspect of inventory management is often overlooked or is not adequately looked after in most of the public sector electrical undertakings in Kerala. This aspect of inventory is positively rewarding in large measure, because inventory is the largest co-partner in the total cost partnership.

Productivity reduces the cost of input and it would be observed how dramatic the results could be through better management.[13]

Let us assume per Rs.200/- worth of annual sales:

Direct material cost	-	Rs.120/-
Average stock (Say eight months)	-	Rs.80/-
Cost of carrying inventories	-	Rs.16/-
Inventory carrying cost (Say 75 per cent)	-	20 per cent

Let us further assume:

Inventories can be reduced by at least	-	20 per cent
Purchase bill can be reduced by at least	-	5 per cent

Results:

Reduction in inventory carrying cost 20 per cent of Rs.16/- (75 per cent being variable thereof)	-	Rs.2.40
Saving through reduction in purchase bill 5 per cent of Rs.120/-	-	Rs.6.00
Total saving	-	Rs.8.40

If an undertaking makes a profit of 10 per cent on sales, the amount of profit is Rs.20/-. Now the profit would be Rs.28.40 which would mean a profit of 14.20 per cent on sales. This increase of 4.20 per cent in profit is equivalent to increasing of sales by 42 per cent.

Conclusion

Great management thinkers have concentrated their observations on labour and attached more importance to the human side of the organisation. The area of materials is usually neglected. However, the business community is realizing the vital role played by materials in any organisation.

It is the control over material costs which makes the organisations stand competitions and help them be top in the world of business. The business community cannot simply forget the area of materials and think of surviving in the market. According to P.F. Drucker[14] materials in a manufacturing business are almost always a cost centre of first magnitude and concentration must center on controlling the costs where they are.

Notes

[1] Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1989-90) pp.117-138.

[2] Sandilya, M.S. and Gopalakrishnan, P., Inventory Management: Text and Cases (New Delhi: MacMillan India Limited, 1981) p.42.

[3] Gopal, K., "Inventory Management," Management Accountant, Vol. 29, No. 7, July 1994: p.596.

[4] Government of Kerala, op.cit., pp.117-138.

[5] ibid., pp.117-138.

[6] Suresh, B.H., "Materials: A Potential Area for Improving Profits," Management Accountant, op.cit., p.209.

[7] Chadda, R.S., Inventory Management in India (New Delhi: Allied Publishers Pvt. Ltd., 1968) p.161.

[8] Raj, K. Nigam, "Capacity Utilisation in Key Public Sector Enterprises," Management Accountant, Vol. 23, No. 12, Dec. 1994: p.210.

[9] Pavaskar, C.V., "Industrial Law for Dynamic Growth," Commerce, 23 Feb. 1985: p.353.

[10] Wayenekeller, "The Critical Areas of Material Cost Control," NACA Bulletin, July 15, 1948. Reprinted in Readings in Cost Accounting, Budgeting and Control, Ed. William E. Thomas: p.640.

[11] Sandilya, M.S. and Gopalakrishnan, P., op.cit., p.40.

[12] Annual Consumption Files of KEL, Traco, TELK, UEI and The Metropolitan Engineering Company Limited, 1989-90.

[13] Khawaja Amjad Saccd, "Productivity Increase and Its Sharing," The Management Accountant, Vol. 26, No. 12, Dec. 1991: p.969.

[14] Peter F., Drucker, Management for Results (New Delhi: Allied Publishers, 1977) p.76.

Chapter VI

Tools and Techniques of Inventory Management

The various concepts of inventories like inventory: a major cost component, lead time influences on inventories and productivity of inventories have been discussed in the fifth chapter.

The basic problem of inventory management is to strike a balance between the operating efficiency and the cost of investment and other associated costs with large inventories, with the object of keeping the basic conflicts at the minimum while optimizing the inventory holding.[1] The decisions as to which item to make and when to keep inventories in balance require application of a wide range of techniques from simple graphical methods to more sophisticated and complex quantitative techniques. Many of these techniques employ concepts and tools of mathematics and statistics and make use of various control theories from engineering and other fields. They are primarily aimed at helping to make better decisions and getting people employed and follow a wiser policy.

Inventory Management Techniques

Various techniques applied for inventory management are as follows:

(1) Selective Inventory Control

(2) Setting of Various Stock Levels

(3) Systems of Inventory Control

(4) Economic Ordering Quantity or E.O.Q. Formula

(5) Re-order Point and Safety Stock

(6) Application of Computers for Inventory

(7) Just-in-Time Inventory Management

(8) Inventory Audit.

(1) Selective Inventory Control

Effective inventory management requires understanding and knowledge of the nature of inventories and, to gain this understanding, some analysis and classification of inventory are required.[2] They are:

(a) A.B.C. Analysis

(b) H.M.L. Analysis

(c) X.Y.Z. Analysis

(d) V.E.D. Analysis

(e) F.S.N. Analysis

(f) S.D.E. Analysis

(g) G.O.L.F. Analysis

(h) S.O.S. Analysis.

Table 6.1

Classification of Inventories

Sl. No.	Title	Basis	Main use
1.	A.B.C. (Always Better Control)	Value of consumption	To control raw material components and work-in-progress inventories in the normal course of business
2.	H.M.L. (High, Medium Low)	Unit price of the material	Mainly to control purchases
3.	X.Y.Z.	Value of items in storage	To review the inventories and their uses at scheduled intervals
4.	V.E.D. (Vital, Essential Desirable)	Criticality of the component	To determine the stocking levels of spare parts
5.	F.S.N. (Fast moving, Slow moving, Non-moving)	Consumption pattern of the component	To control obsolescence
6.	S.D.E. (Scarce, Difficult, Easy to obtain)	Problems faced in procurement	Lead time analysis and purchasing strategies
7.	G.O.L.F. (Government, Ordinary, Local, Foreign Sources)	Source of the material	Procurement strategies
8.	S.O.S. (Seasonal, Off-Seasonal)	Nature of supplies	Procurement/holding strategies for seasonal items like agricultural prcducts

Source: Sandilya, M.S. and Gopalakrishnan, P., Inventory Management: Text and Cases (Delhi: MacMillan India Limited, 1981) p.51.

The motive behind the above analyses and classifications is to tackle important aspects more rigorously. Moreover, an equally critical analysis of all items will be very expensive and will have a diffused effect regardless of priorities. Table 6.1 shows the available classifications, their bases and their uses.

A.B.C. Analysis

The method follows the general principles of Pareto (Wilfredo Pareto, Italy, 1896) that "in any series of elements to be controlled, a selected small fraction in terms of numbers of elements would always account for a large fraction in terms of effect."[3] With some practices, the limits of 'A', 'B' and 'C' can be easily determined by a Pareto Analysis; namely 'A' items do not exceed more than 70 per cent of the investment, 'B' items account for only a moderate share, and 'C' items for less than 10 per cent of total investment.

The A.B.C. Analysis is a rational approach for determining the degree of control that should be exercised on each item in inventories. Obviously, 'A' class items should be subjected to strict management control under either continuous review or periodic review with short review cycles. 'C' class items require little attention and can be relegated down the line for periodic review say, just once a year. Control over 'B' class items should be somewhere in-between.

The method of A.B.C. classification for managing inventories has been adopted in the public sector electrical industrial units in Kerala. Inventories of these undertakings are classified into various categories on the basis of their importance, namely their value and frequency of replenishment during a period. One category called group 'A' items, consists of only a small percentage of the total items handled but has a combined value that constitutes a major or large portion of the total stock holding of the concern. The second category consisting of group 'B' items is relatively less important. The third category consisting of 'C' items is of least importance, i.e., the group consists of a very large number of items, the value of which is not very high.

A.B.C. Analysis of UEI

For the purpose of A.B.C. classification of inventories and the method of control to be adopted for each category of items, the company first of all lists out all the items of inventory and values of each item. The value is obtained by multiplying the average annual consumption of an item during a period by its unit cost. The items in the list are then rearranged in the descending order of their values irrespective of their quantities. Thus 200 kg. of an item valued at Rs.2,00,000/- should be ranked earlier than 20,000 kg. of another item, the value of which is Rs.18,000/-. A running total of all the values is then taken. It is found that a large percentage of the total value is covered by the first few items in the list. They are grouped in the 'A' category, the next few items which have the next least value under 'B' group and the last value items are grouped under 'C' category. So, by controlling the 'A' group items only, a better inventory control is possible. Table 6.2 shows the classification of inventories and its annual consumption value of the United Electrical Industries Limited.

An analysis of the annual consumption of the UEI shows that 80 per cent of the total number of items are under category 'A'. Similarly five per cent of the total annual consumption value accounts for more than 70 per cent of the total number of items under category 'C' and 15 per cent of the total annual consumption value accounts for nearly 20 per cent of the total number of items under category 'B'. Table 6.3 shows the above characteristics.

Table 6.2

Classification of Inventories

and its Annual Consumption Value

of United Electrical Industries Limited

Sl. No.	Name of Item	Annual Consumption Value
	A Group	
1.	Magnet	74,00,000
2.	41 S.N.G.	55,00,000
3.	Lamination	41,00,000
4.	Brass Terminals	22,00,000
5.	Magnet Yoke	10,00,000
	B Group	
1.	Copper Strips	73,000
2.	M.S. Screws Hl	72,000
3.	Sealing Led	71,000
4.	Press-Phan Sheet	70,000
5.	Charcoal	68,000
	C Group	
1.	Grinding Wheel	14,000
2.	Leather Glouse	14,000
3.	Screw Drivers	13,000
4.	Insulation Tape	12,000
5.	Acid	11,000

Source: Annual Consumption File, U.E.I.

Table 6.3

A.B.C. Analysis of United Electrical Industries Limited

Class	Number of Item (% of total)	Value of Item (% of total)
A	10	80
B	20	15
C	70	5

Source: Annual Consumption File, U.E.I.

Table 6.3 is depicted graphically in Figure 6.1.

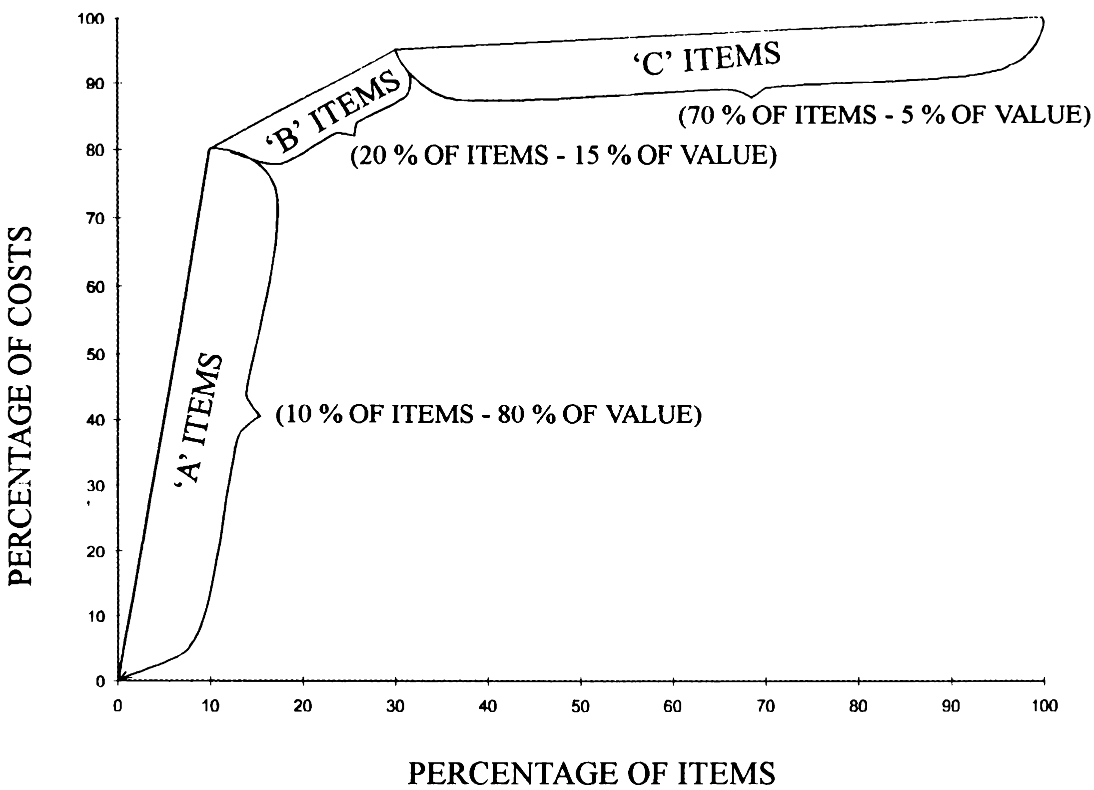
(2) **Setting of Various Stock Levels**

The various stock levels fixed for effective management of inventories are maximum level, minimum level, ordering or reordering level and danger level. These levels serve as indices for initiating action on time so that the quantity of each item of material, i.e., the inventory holding is controlled.

Stock levels are not fixed on a permanent basis but are liable to revision in accordance with the changes in the factors determining the levels.

Figure 6.1

A B C Analysis in U.E.I



The formulae used for fixing various levels are:

Maximum Level

= Re-order level − Expected minimum consumption in units during minimum weeks to obtain delivery + Re-order quantity

Minimum Level

= Re-order level − (Average usage per period x Average time to obtain delivery)

Re-order Level

= Maximum re-order period x Maximum usage

Average Stock Level

$$= \frac{\text{Maximum level} + \text{Minimum level}}{2}$$

Danger level is fixed usually below the minimum level. When the stock reaches this level, very urgent action for purchase is indicated. This presupposes that the minimum level contains a cushion to cover such contingencies.

Procedure of Determining Stock Levels in UEI

In UEI the stock control is made on the basis of three levels such as:

(a) Minimum level

(b) Maximum level

(c) Mean level.

A safety stock (minimum stock) is maintained for each stock item to provide a cushion for the following emergencies:

(i) Supplies being delayed beyond normal lead time.

(ii) Consumption rate exceeding estimated average rate.

(a) **Minimum Level**

A formula which is used by the company for fixing minimum level is:

$$Smin = (Cmax \times Lmax) - (Cav \times Lav)$$

Where

Smin = Minimum stock

Cmax = Maximum rate of consumption per month

Lmax = Average rate of consumption per month

Cav = Maximum lead time in month or maximum period between two consecutive phased supplies

Lav = Average lead time.

(b) **Maximum Level**

Maximum stock is the minimum stock plus the phased supply quantity plus one or two months consumption (to allow for receipt of the phased supply arriving ahead of the expected time or before the stock reaches the minimum level).

If the actual stock of any item exceeds the maximum level then the next phased supply is deferred or revoked as found necessary.

Formula used for fixing maximum level is

Smin = (Cmax x Lmax) + Qa + B

Where

Smin = Minimum stock

Cmax = Maximum consumption per month

Lmax = Maximum lead time

Qa = Quantity receivable for phased supply against annual indent.

B = Extra quantity to be provided for special indent.

(c) **Mean Level**

Mean level is the average of maximum and minimum stock levels. In UEI in the case of 'B' items a review of the next phased supply is made when stocks in hand touch this mean level and necessary action is taken as follows:

(i) If the stocks are not adequate to meet the requirements till the expected time of receiving the next phased supply, the next phased supply will be advanced or extra quantity will be procured by special indent.

(ii) If the receipt of the next supply is likely to result in exceeding the maximum level, the next supply will be deferred or the quantity reduced. It is found that stock levels are fixed for all the stores items on the basis of anticipated annual consumption by January of every year.

The formula used for fixing mean level is:

$$Scon = \frac{Smax + Smin}{2}$$

Where

Scon = Control stock level

Smax = Maximum stock

Smin = Minimum stock

Ready reckoner tables for fixing maximum, minimum and average stock levels are given in Appendixes 6.1, 6.2 and 6.3.

(3) **Systems of Inventory Control**

The main systems of inventory control are:

(a) Perpetual Inventory (Automatic Inventory) System

(b) Double Bin System.

(a) **Perpetual Inventory System**

The control of inventories while in storage is effected through what is known as the perpetual inventory. Thus the two main functions of the perpetual inventory are:[4]

(i) Recording store receipts and issues so as to determine at any time the stock in hand, in quantity or value or both, without the need for physical count of stock.

(ii) Continuous verification of the physical stock with reference to the balance recorded in the stores records, at any frequency, as convenient for the management.

In KEL, TELK and UEI, a senior clerk is responsible to the cost accountant for organising perpetual verification of the stores. Various stocks which come under A.B.C. classes are checked in the following ways:

Class 'A' items	-	Three times per year
Class 'B' items	-	Once a year
Class 'C' items	-	Once in every two years.

But in the Metropolitan Engineering Company Limited and the Traco Cable Company Limited, the assistant production manager is responsible for organising perpetual verification of the stores. Various stocks of these units that come under A.B.C. classes are verified in the following manner.

Class 'A' items - Two times per year

Class 'B' items - Once in every two years

Class 'C' items - Once in every three years.

Physical verification of an item is carried out when the stock is at minimum so that the quantity checked is as small as possible. The programme for verification is arranged in such a way that physical checking is carried out just prior to the next anticipated phased supply. Whenever feasible, incoming supplies are stored and stocked separately and will not be issued out until the earlier stocks are completely exhausted.

Perpetual inventory system consists of:

(i) Bin cards

(ii) Stores ledger, and

(iii) Continuous stock taking.

(i) **Bin Cards**

Bin cards are printed cards used for accounting stock of materials in store. For every item of materials separate bin cards are kept by the concerns (Figure 6.2).

Figure 6.2
Specimen of Bin Card in U.E.I

U. E. I. LTD., QUILON   STOCK CARD No.   DESCRIPTION   PART No.   UNIT

DATE	REF. No.	SUPPLIER'S NAME	RECEIPTS		ISSUES	RATE	BALANCE	INITIAL
			QUANTITY	AMOUNT				

Source: Annual Consumption File, U.E.I

Details regarding the material such as name of material, part number, date of receipt and issue, reference number, name of supplier, quantity received and issued, value of material, rate, balance quantity etc., are recorded in the bin cards. The bin cards are kept in the bin serially according to part number of the component. At the end of the financial year the balance quantity in the bin cards is taken as closing stock, and it is valued at rates in the bin cards.

Bin Card Valuation

Stocks in the public sector electrical industrial units in Kerala are valued under the weighted average system. In this system, the average rate of the item is arrived at by taking into account the value of previous stock. The quantity of the previous stock is added to the receipt. The total value of the previous stock and new receipt is divided by the total quantity. The resultant figure is the weighted average rate of that item, i.e.,

Weighted average

$$= \frac{\text{Value of stock in hand} + \text{Value of the materials received/purchased}}{\text{Quantity of material in hand} + \text{Quantity of material received/purchased}}$$

(ii) Stores Ledger

Like bin cards, stores ledger is maintained to record all receipts and issues in respect of materials with the difference that along with the quantities, the values are entered in the receipt, issue and balance columns. Additional information as noted in the bin cards regarding quantity on order and quantity reserved, together with their values may also be recorded in the stores ledger.

(iii) Continuous Stock Taking

The perpetual inventory system is not complete without a systematic procedure for physical verification of stores. The bin cards and stores ledger record the balances but their correctness can be verified by means of physical verification only.

There is a proper procedure for the physical verification of stocks in the public sector electrical industrial units in Kerala. The excess/ shortage found in the verification is reported to higher authorities for action and to avoid differences in stock.

In the Auditors Report for the financial year 1990-91, it is recorded that "the procedures of physical verification of stocks followed by the management are reasonable and adequate in relation to the size of the undertakings and the nature of its (sic) business. The discrepancies as shown by the records, between the physical stocks and the book stocks, which were not material, have been properly dealt with in the books of account."[5]

Physical Verification Report

It is necessary to record the result of stock verification in a separate record or report (Figure 6.3). These reports are maintained date-wise so that when arranged together they give a chronological list of the items verified. The quantity actually found on stock verification is noted in the proper column by the stock verifier who also enters the verification report, the balance on date as shown in the bin card. The report, is then sent to the stores ledger clerk who enters the balance as recorded in the stores ledger. Thus for each item of store in the stock verification report, there are three sets of entries for the quantity (Figure 6.3).

Figure 6.3

Specimen of Physical Verification Report in U.E.I

PHYSICAL VERIFICATION REPORT No. ....

U. E. I. LTD., QUILON

Dated ....

Bin Card No.	Part No.	Description	Unit	Bincard Balance	Physical Balance	Excess		Shortage		As on Date of Verification		Remarks
						Qty.	Value	Qty.	Value	No. of Issues	Total Qty. Issued	

Source: Annual Consumption File, U.E.I

Value Analysis

Value analysis is a recently developed technique in the UEI, TELK and KEL to obtain optimum benefit from materials. This implies the minimizing of the value of materials consumed which, in turn, enables reduction of the inventory to be carried out.[6]

Value analysis investigation is usually carried out every year for 'A' and 'B' items in order to:

(i) minimize its consumption

(ii) substitute it with cheaper materials in all or some of the application for which it is presently used.

Disposal of Surplus and Deteriorated Items

In the UEI, TELK and KEL, a committee is formed for the disposal of surplus and deteriorated items whenever required.

(b) **Double Bin System**

Double bin system is a recently developed technique in the KEL in respect of low consumption value items i.e., items belonging to class 'C' in A.B.C. analysis. This system separates the stock of each item into two bins, one to store the quantity equal to minimum quantity and the other to store the remaining quantity. The staff has instructions not to use the quantity in the smaller portion as long as there is stock in the other portion. As soon as it becomes necessary to use the quantity marked as minimum, it is a signal to place new orders. When the fresh order is received, the minimum quantity is segregated.

Double bin system is ideal for items for which demand and lead time are fairly regular and established. It also avoids the necessity of taking physical inventories as in the case of perpetual inventory system. Since the storekeeper knows automatically when to initiate replenishment action, this being the time when he is forced to dip his hand into the minimum stock bin.

In the fixed order quantity or double bin system, there is built-in safety in that the replenishment interval between two successive orders varies and hence adequate arrangements are required to take care of variations in the rate of demand. If the usage rate rises, the re-order level is reached earlier than expected so that the replenishment interval is shortened. On the other hand, if the rate of usage goes down the replenishment interval is lightened. In either case, safety stock has to provide protection against variation in demand in lead time only.

This is explained with the following illustration relating to an item of low consumption value on which replenishments are obtained.[7]

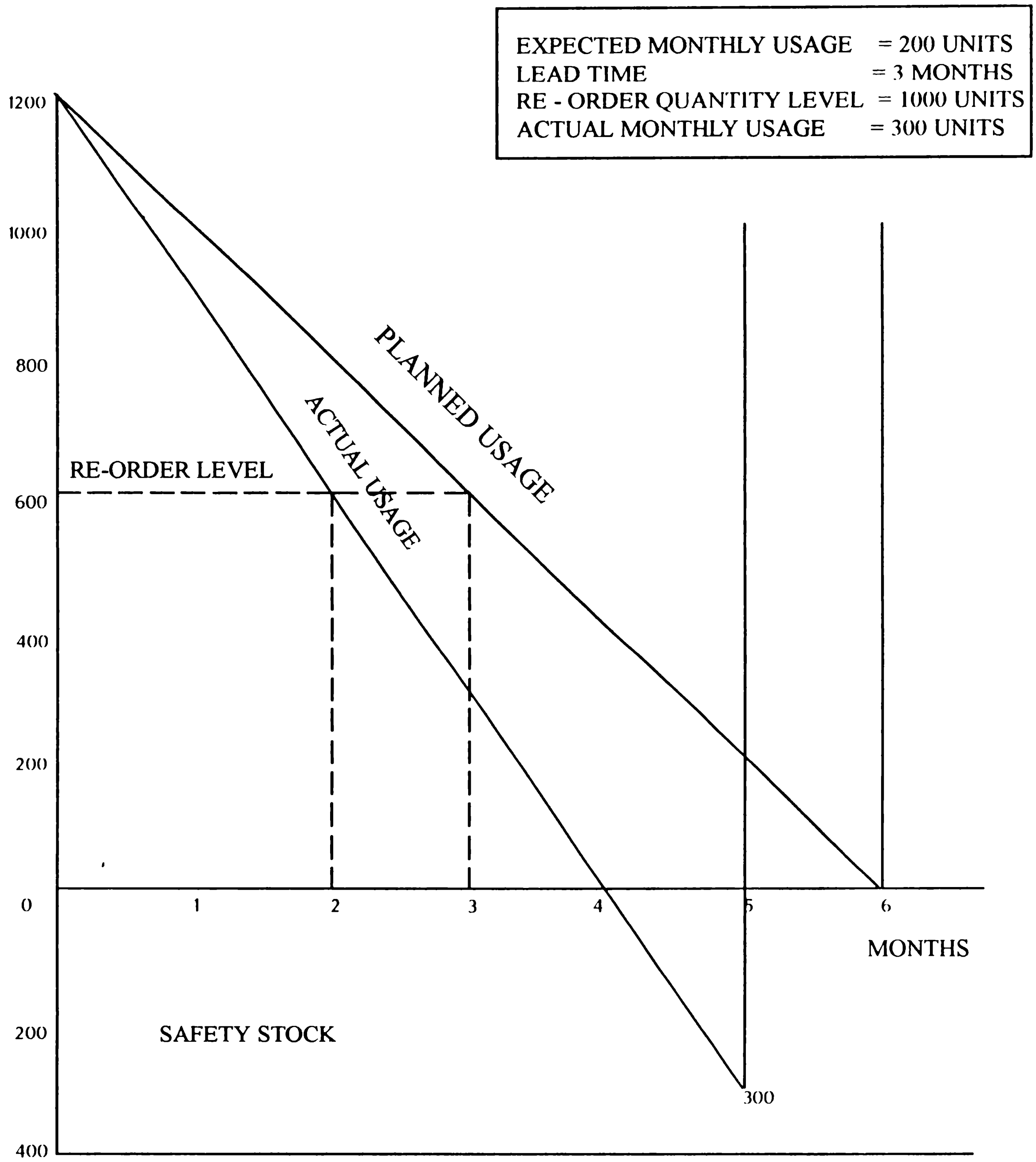
Let

Expected monthly usage of the item	=	200 units
Provision of safety stock at 2 months supply	=	400 units
Lead time for procurement of the item	=	3 months
Order quantity at 6 months supply	=	1200 units
Actual monthly usage in a period of 6 months	=	300 units

Here order level is 1000 units comprising 400 units of safety stock and 600 units of expected usage during the lead time of three months. As a result of rise in usage rate, the position would be as shown in Figure 6.4. The re-order level will be reached after two months in lieu of the expected three months. A fresh order will then be placed for 1200 units. The shipment will arrive after another three months, i.e., at the end of the fifth month. By that time 5 x 300 = 1500 units will have been consumed. In other words, all of the 1,200 units of working inventory and 300 units of safety stock will be consumed by the time the new shipment arrives. The amount of safety stock at the time of receiving fresh supplies will be 100 units. The safety stock will be largely eaten up but there will be no stock out.

Figure 6.4

Double Bin System in KEL



(4) Economic Ordering Quantity or E.O.Q. Formula

In the fixed order quantity system the re-order quantity is the economic order quantity that is fixed in such a manner that would minimize the total variable cost of managing the inventory. The various components of this cost are as follows:

(a) Procurement cost (this includes administrative and provisioning costs)

(b) Storage cost (this includes carrying, handling etc.)

(c) Stock out cost (this may be laid down by management according to its policy).

The appropriate term economic order quantity appears to be "economic lot size" meaning thereby the quantity that should be accepted per occasion so as to make the inventory procurement cost equal to the inventory carrying cost.[8]

A company is said to be on a point of minimum cost when its ordering cost is just equal to the carrying cost. In other words, a company should neither store excess quantity of material nor should it frequently place too many orders for the same material. When unit price is same regardless of the quantity purchased, the following formula is used. Then it is found that the order quantity varies in proportion to the square root of the demand. There are indices given on scientific basis to order quantity, keeping in view the position costs of inventories, viz., the set up costs, ordering costs and carrying costs. This is known as Economic Order Quantity (EOQ) or Square Root Formula, developed by R.H. Wilson around the thirties and may be modified according to necessity.[9]

$$\text{EOQ or } D = \sqrt{\frac{2Q(a)}{c}}$$

Where

Q = Annual requirement in units

a = Unit cost of placing an order

c = Annual carrying cost

D = Optimum lot quantity or batch size.

This can be verified with reference to the following table assumptions:

Cost of each article is one rupee. Annual demand is 40,000 units. Cost of carrying inventory is 20 per cent. Cost per order is Rs.10/-. Using the formula

$$D = \sqrt{\frac{2Q(a)}{c}}$$

$$D = \sqrt{\frac{2 \times 10 \times 40{,}000}{1 \times 0.20}}$$

$$D = \sqrt{40{,}00{,}000}$$

$$D = 2{,}000 \text{ units.}$$

Here the economic order quantity is 2,000 units. When EOQ is 2,000 units, the number of orders to be placed in a year is 20 and the total cost is Rs.400/- (both total ordering cost and inventory carrying cost are the same, i.e., Rs.200/- + Rs.200/-) (Table 6.4).

Table 6.4

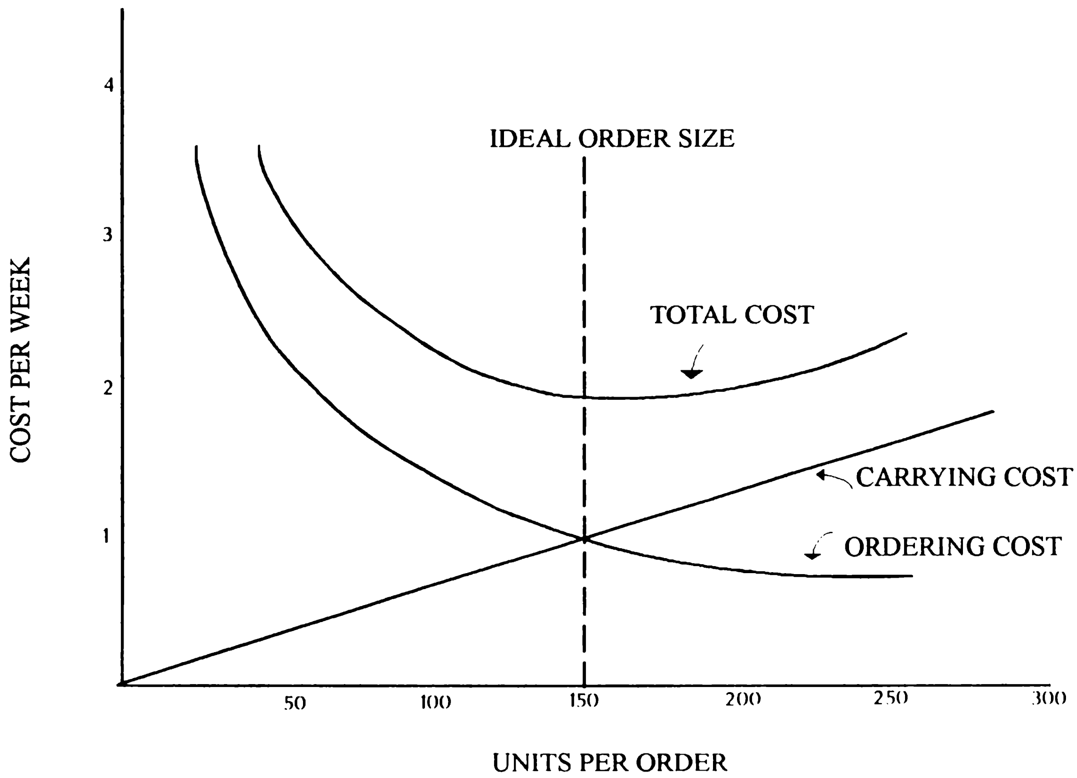
Tabular Presentation of Economic Order Quantity of 2000 Units

Number of orders placed	Order Quantity	Average Stock Holding	Inventory Carrying Cost (Rs.)	Ordering Cost (Rs.)	Total Cost (Rs.)
1	40,000	20,000	4,000	10	4,010
2	20,000	10,000	2,000	20	2,020
3	13,333	6,667	1,333	30	1,363
4	10,000	5,000	1,000	40	1,040
5	8,000	4,000	800	50	850
10	4,000	2,000	400	100	500
15	2,667	1,334	267	150	417
20	**2,000**	1,000	200	200	**400**
25	1,600	800	160	250	410
30	1,333	667	133	300	433

The graphical presentation of the behaviour of ordering and carrying costs is shown in Figure 6.5.

Figure 6.5

Behaviour of Ordering and Carrying Costs



(5) Re-order Point and Safety Stock

The computation re-order point in the public sector electrical industrial units in Kerala is expressed in terms of number of units per day, multiplied by the lead time in days with adjustments to provide safety stock. Thus the formula followed is:

Re-order point

= Average daily usage x lead time in days + safety stock

Safety stock refers to extra inventory held as a protection against the possibility of a stock out. Stock outs are not only costly but also highly embarrassing to the concern. Thus the safety stock is to be provided to avoid stock out situation that may arise due to unforeseen increase in the rate of consumption during lead time and also increase in the lead time itself.

The problem of safety stock usually does not occur with regard to certain items which are readily available from local sources and those for which substitutes are available. Therefore, the level of safety stock of an item would depend upon whether its shortage would promptly be met, and if not what the stock out cost would be.

The quantity of safety stock to be carried depends upon how much of safety is to be secured or stock outs incurred. Instances are not rare in the public sector electrical industrial units in Kerala where at each level of decision making, an adhoc safety of 10 per cent is added. Such an approach will automatically result in undue overstocking. A larger inventory of safety stock means higher inventory carrying cost. While fixing safety stock in these industrial units the following considerations are to be made:

(a) Analysis of lead time in terms of fluctuations.
(b) Usage behaviour—study of fluctuations in rate of consumption.
(c) Importance of the item in the manufacturing programme.
(d) Frequency of the suppliers not honouring commitments on delivery.
(e) Stock out cost.

Safety stock level can also be determined through statistical formula, although there is a good deal of controversy regarding its outright application. There are two commonly employed probability approaches to inventory control in which demand varies. They are:

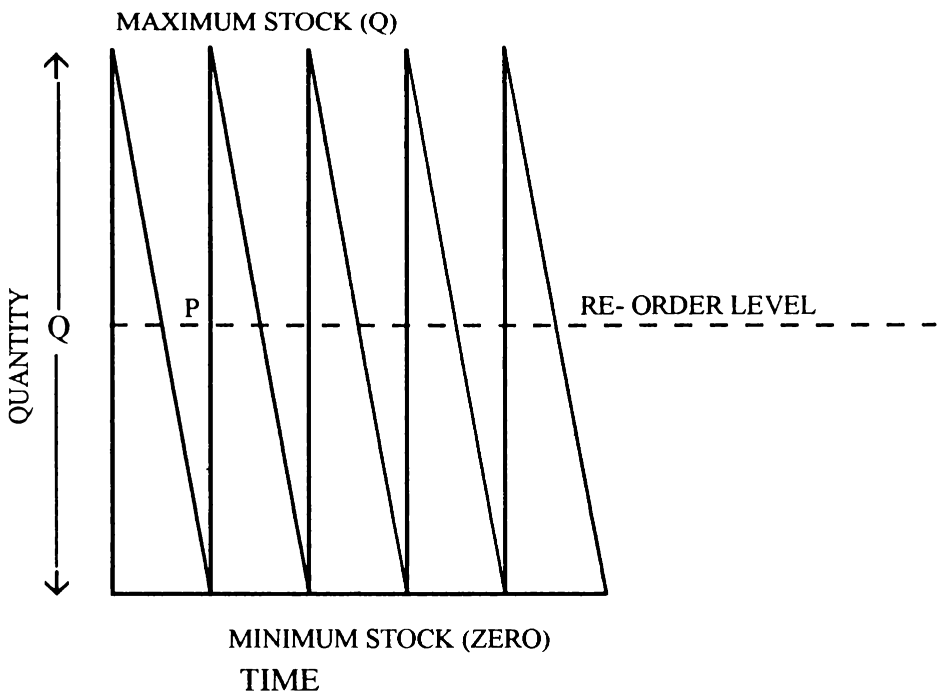
(a) Fixed Quantity-Variable Cycle System, and
(b) Fixed Cycle-Variable Quantity System.

Fixed quantity-variable cycle system considers buying a fixed lot size at varying intervals. The fixed quantity may be determined by the use of the EOQ formula. This approach is most often used for medium and low value items, where lesser control is allowable.

Fixed cycle-variable quantity system is followed for controlling of high value, critical and rapidly depreciable inventory items where close control is a must. Under this system, it is necessary to vary the lot size as demand changes, while keeping the interval for placement orders constant.

Figure 6.6 demonstrates how inventory should fluctuate when forecasts of lead time and usage are accurate. When stock level reaches the order point 'P', the quantity to be ordered is 'Q'. It arrives exactly when stock reaches 'zero' balance. The maximum stock, therefore, is 'Q' and the minimum stock is 'Zero'. In such ideal conditions, there would be no fear of shortages and no need for safety stocks. A fixed amount would be re-ordered at fixed intervals.

Figure 6.6
Fluctuation of Inventory



(6) Application of Computers for Inventory

The scope of application of computers in areas like inventory management is really immense. But very few of the public sector electrical undertakings in India have applied the computer for inventory management and other decision making purposes. The bulk of the applications are in the areas of mundane pay-roll accounting and billing where the computer has been turned into an efficient clerk and printing machine.

Regular inventory management operations can be easily computerised.[10] With the basic issues and receipts document, the materials ledger can be kept up-to-date. Inventory planning, material budgeting and inventory valuation can be very efficiently computerised. Applications such as bill of materials, A.B.C., X.Y.Z. and F.S.N. analysis can be done periodically. Similarly, the minimum, maximum and safety stock levels can be fixed with the help of computers. Moreover, if the manual or mechanised system has been properly designed, the implementation of a computerised system will not pose any problem.

The changeover from a mechanised to a computerised system depends on the volume of the work involved.

On an average, about one per cent to two per cent of the turnover can be spent on data processing. If a computer facility can undertake to perform the required job at this cost, the change over would be advisable. In addition to the job performed by the mechanised process, the computer's access to memory can store data.

The computerised systems for managing inventories have not so far been introduced in the public sector electrical industrial units in Kerala.

(7) Just-in-Time Inventory Management

Many successful Japanese companies use a radically different manufacturing philosophy popularly and descriptively termed "just-in-time". It is not just a battery of technique but a grand manufacturing philosophy. The purpose behind the technique is to eliminate waste—not only the conventional form of waste such as scrap, rework and equipment downtime, but also excess lead time, overproduction and poor space utilisation.

JIT as a philosophy has apparently worked well in Japanese manufacturing context but its applicability in the public sector electrical industrial units in Kerala needs to be investigated.[11] The basic principal of this philosophy is to produce at each manufacturing stage only the necessary products at the necessary time in the necessary quantity to hold the successive manufacturing stages together. It provides a smoother production flow with the goal to achieve a single unit lot size. An organisation cannot adopt JIT in isolation from its environment—both internal and external. Hence it is important to identify the environmental parameters relevant to the success of JIT programme.

A Comparison of the Japanese and the Indian Situation

JIT has been developed and implemented in Japan. The system of production and quality management that the Japanese have developed has deep cultural and national roots. Hence a comparison of Japanese and Indian industries will help examine the applicability of JIT in Indian environment and also identify the possible problem areas and steps to be taken to tackle those problems. Table 6.4 shows the comparison of attributes in Japanese and Indian industries.[12]

Table 6.5

Comparison of Attributes in Japanese and Indian Industries

Sl. No.	Category	Japanese Industry	Indian Industry
1.	People	a. Japanese workers co-operation, dedication, harmony and group thinking decision process.	a. Indian workers Every man for himself thinking.
		Takes pride in his company high level of motivation.	Usually does not identify himself with the company, comparative lack of motivation.
		High literacy	Literacy low.
		Multi-functional workers.	Specialised workers.
		b. Enterprise Union (Japan is a homogenous society)	b. Interaction between the people at various levels.
2.	Plants	High-level of automation; CAD/CAM robotics used.	Very less automation; CAD/CAM robotics largely absent.
		Group Technology present	Group Technology absent.
		Autonomous Machining, 100% inspection used.	These techniques absent.
		Lighted displays to highlight trouble spots are used.	Not used

		Ccmpanies have there own tocl makers to build machines.	Machines brought fram outside usually on the basis of what is available.
		Orderliness, cleanliness and arrangement practised	Comparatively untidy and disorganised.
3.	Quality Control	Quality at the source, defect prevention.	Statistical sampling after lot has been produced, defect detection.
		Workers and Foremen have primary responsibility for quality.	Quality is the responsibility of Quality Control Department.
		100% quality present.	Absent.
4.	Production Management	Kanban (Pull System).	MRP (Push System).
		Preventive maintenance.	100% preventive maintenance absent.
		Production line slow up for quality problems, speed up when quality is right	Production line runs at fixed rate; quality problems are sent off line.
5.	Prcduct and its Value	Customer oriented product, provides real value.	R & D lacking, product designs depend upon what is available rather than what the customer demands.
		Belief in large term gains, low profit margin.	Strive for shorter term gains.

Source: Prem Vrat, Saurabh Mittal and Kavi Tyagi, "Implementation of JIT in Indian Environment: A Delphi Study," Productivity, Vol. 34, No. 2, July-Sept. 1993: p.255.

The various problems identified and imperative to be tackled in the public sector electrical industrial units in Kerala for the implementation of JIT are:

(a) Reduction of set-up times

(b) Kanban system

(c) Delivery (from vendor) of exact quantity on exact time

(d) Preventive maintenance, and

(e) Group technology.

All these problems can be tackled only with a very serious planned effort. Workers motivation and literacy need to be enhanced. These are important for reducing set-up time and introducing Kanban systems. Moreover, the involvement and commitment of top management are needed to bring a drastic change in the working environment and change of attitude in people. These changes are difficult but possible.

As there are wide differences in the operating environments of Japanese and Indian industries, the work environments in the public sector electrical industrial units in Kerala are to be improved before the implementation of JIT. It requires almost 10 to 20 years.

(8) **Inventory Audit**

The public sector electrical industrial units in Kerala, particularly face the problem of inventory build-up and consequent locking up of capital. This calls for an inventory audit. The main aspects of this audit may comprise:[13]

(a) The testing and the appraisal of the policy to be pursued by the industrial unit regarding inventory forecasting, planning and control.

(b) Appraisal of inventory valuation method.

(c) Testing and appraisal of the inventory forecasting and planning models.

(d) Testing and appraisal of control aspects.

(e) Testing the maintenance aspects of inventory as well as inventory records.

Like internal audit, the inventory audit should also be made a routine feature of the industrial units and has to be done with qualified hands within the organisation as by an outside inventory audit team.

During inventory audit, certain items should be audited with due care to effect economy in the organisation. They are:

(a) raw materials

(b) work-in-progress

(c) finished goods

(d) stores and spare parts

(e) loose tools and others, and

(f) by-products and scraps.

Inventory audit of an industrial unit is to be chalked out with the following programmes (Figure 6.7):

(a) Auditing the process of manufacture

(b) Audit of raw materials

(c) Audit of stores and spares

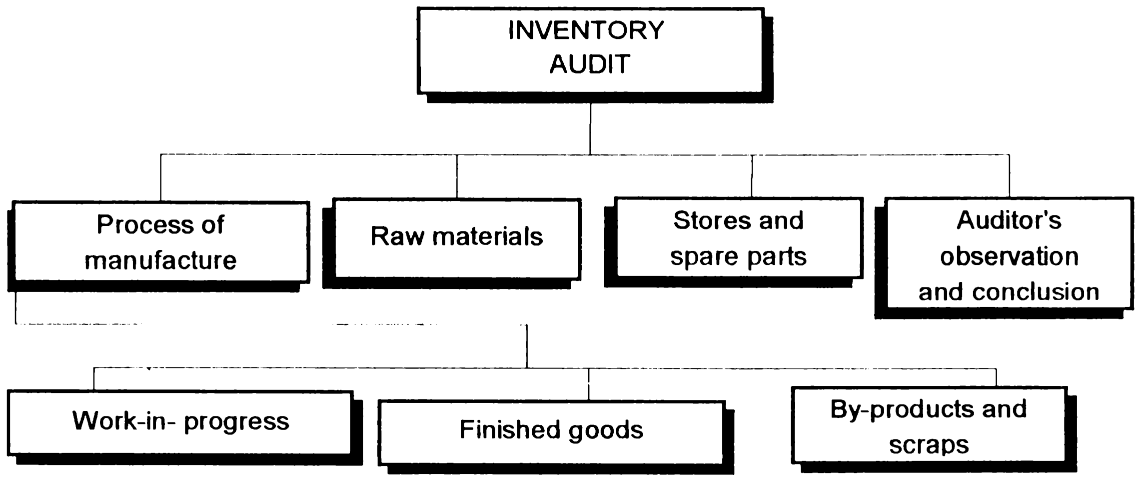
(d) Auditors observations and conclusions.

(a) **Auditing the Process of Manufacture**

The cost auditor should be aware of the technical aspects of the process of manufacture of the main products and by-products and scraps of the industrial unit under audit. He should account the cost aspects involved in the process of manufacture and try to evaluate the possibility of effecting economy of the costs involved in the process of manufacture.

Figure 6.7

Inventory Audit Programme



Source : Ramachandran K.B, " Need for Inventory Audit in Public Sector Enterprises", Management Accountant, vol.24, No.8 , Aug. 1989: P.494

(b) Audit of Raw Materials

The cost auditor should ascertain whether the industrial unit follows standard purchase procedure for purchasing of raw materials. The cost of major raw materials consumed both in terms of quantity and value should be technically evaluated with similar firms in the industry. This will bring into light the ways and means of utilising scarce resources in a fruitful manner. The quantity and value of imported and indigenous raw materials used in the manufacturing process and/or production purposes may be reviewed and the usage of main raw materials should be evaluated.

The non-moving materials from one to five years should be seriously viewed and a report covering all the above aspects is to be prepared.

(c) Audit of Stores and Spares

The procurement and utilisation of stores and spare parts should be carefully gone through for effecting savings. The movement of stores and spare parts at different intervals should be audited. It should be ascertained whether scientific method of procuring is followed. The non-moving items for more than two years and the action taken by top management to avoid such redundant investments should be audited. The type of stores and spare parts for want of which production is affected often should also be audited and reported.

(d) Auditors Observations and Conclusions

The cost auditor should observe the following with respect to the inventory audit:

(i) Whether the firm's funds have been used in a negligent or inefficient manner.

(ii) Whether factors due to inventories which could have been controlled but not done resulted in increase in cost of production.

(iii) Whether contracts/agreements relating to purchasing/ selling of inventory items had any undue benefits.

(iv) Whether improvement in performance is possible by rectification of general imbalance in production facilities or by concentration on areas offering scope for cost reduction and increased productivity.

(v) Whether improved inventory policies will be useful for effecting improvement and savings in inventory.

Conclusion

The public sector electrical industrial units in Kerala have adopted certain efficient techniques like A.B.C. analysis, perpetual inventory etc., for controlling their inventories. But with the advent of Electronic Data Processing, better selective inventory control measures are available the adoption of which will lead to better control of inventory at a reduced amount of investment. The just-in-time inventory control technique can be implemented only after improving the work environment. The control measures such as EOQ and fixing of material stock levels are not strictly adhered to by the industrial units. So it results in high inventory cost.

Notes

[1] Sandilya, M.S. and Gopalakrishnan, P., Inventory Management: Text and Cases (New Delhi: MacMillan India Limited, 1981) p.51.

[2] Iyengar, A.V.K., Inventory Management (Madras: Institute for Financial Management and Research, 1980) p.17.

[3] Colin, D. Lewis, Demand Analysis and Inventory Control (Great Britain: Saxon House, 1975) p.91.

[4] Murali, R. and Sinha S.K., "Inventory Management: A Probe and Scope in Coal Mining Industry," Management Accountant, Vol. 26, No. 12, Dec. 1991: p.939.

[5] Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, March, 1991) p.xiv.

[6] Dutta, A.N., "Value Added: Measurement by Contribution," Management Accountant, Vol. 22, No. 1, Jan. 1987: p.31.

[7] Chadda, R.S., Inventory Management in India (New Delhi: Allied Publishers Pvt. Ltd., 1968) p.171.

[8] Owler, L.W.J. and Brown, J.L., Wheldon's Cost Accounting and Costing Methods (Plymouth: MacDonald and Evans Limited, 1975) p.46.

[9] Colin, D. Lewis, op.cit., p.135.

[10] Murali, R. and Sinha S.K., op.cit., p.940.

[11] Prem Vrat Saurabh Mittal and Kavi Tyagi., "Implementation of JIT in Indian Environment: A Delphi Study," Productivity, Vol. 34, No. 2, July-Sept. 1993: pp.251-256.

[12] ibid., pp.251-256.

[13] Ramachandran, K.B., "Need for Inventory Audit in Public Sector Enterprises," Management Accountant, Vol. 24, No. 8, Aug. 1989: p.493.

Chapter VII

Inventory Ratios

The impact of various inventory management techniques such as A.B.C. analysis, perpetual inventory etc., adopted in the public sector electrical undertakings in Kerala by itself is vague. An analysis of inventory ratios will clarify this point.

Ratio analysis is a guideline for planning and controlling of inventories of an industrial unit. It gives relative or comparative information regarding the performance of the inventory function. Ratios useful to inventory management are:[1]

(1) Inventory Turnover Ratio (ITR)

(2) Number of Days Stock in Hand Ratio

(3) Return per Rupee Invested Ratio

(1) Inventory Turnover Ratio (ITR)

This ratio is an important parameter used to evaluate the performance of the inventory function.[2]

$$\text{ITR} = \frac{\text{Cost of sales during the period}}{\text{Average stock held during the period}}$$

Inventory turnover ratio is calculated to evaluate the adequacy of the quantum of capital and its justification for investing in stock or inventory. The quantum of stock should be sufficient to meet the demand of the company or industrial unit. An increase in the turnover rate implies a more efficient use of the inventory and a reduction in working capital needs. But it should not be too large to indicate the unnecessary block up of capital in inventory.

The inventory turnover ratio is around three in the public sector electrical industry in Kerala (Table 7.1). It was 5.40, 5.69 and 9.03 respectively during 1989-90 as against 2.08, 3.20 and 1.09 during 1981-82 in the K.E.L., U.E.I. and Metropolitan Engineering Company Limited respectively (Table 7.2).

The inventory turnover ratios of all the five public sector electrical industrial units in Kerala are shown in Table 7.2 (from 1981-82 to 1989-90). The basic data are collected from the Review of Public Enterprises in Kerala. The data given in Chapter IV regarding inventory to current assets and inventory to consumption can also be used for the purpose of evaluation.

(2) **Number of Days Stock in Hand Ratio**

Number of Days Stock in Hand Ratio is:[3]

$$\frac{\text{Stock x 365}}{\text{Cost of Sales}}$$

This ratio measures the efficiency in selling the goods. Smaller the number of days stock in hand, higher the efficiency in inventory management.

The number of days stock in hand is around 140 in the public sector electrical industry in Kerala (Table 7.1). This ratio showed a diminishing trend year by year except in the Traco Cable Company Limited during 1986-87 and 1987-88 (Table 7.3). This is a sign of increasing efficiency in selling the goods and in inventory management.

(3) **Return per Rupee Invested Ratio**

Return per rupee invested ratio is given by:[4]

$$\frac{\text{Annual Gross Margin}}{\text{Inventory}}$$

This ratio shows efficiency in management of inventory in terms of profitability. Higher the ratio, better the management.

The return per rupee invested is around (-)0.50 i.e., negative, in the public sector electrical industry in Kerala (Table 7.1). This ratio showed a diminishing trend year by year except in the Traco Cable Company Limited during 1988-89 and 1989-90 and in the United Electrical Industries Limited during 1989-90 (Table 7.4). This is an indication of decreasing efficiency in management of inventories in terms of profitability.

Opening stock, closing stock, average stock and gross margin in the public sector electrical industrial units in Kerala from 1981-82 to 1989-90 are shown in the Appendixes 7.1, 7.2, 7.3 and 7.4 respectively.

Table 7.1

Inventory Ratios of Public sector Electrical Industry in Kerala from 1981-82 to 1989-90

Sl. No.	Name of Ratio	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Inventory Turnover Ratio	2.10	2.50	2.10	2.29	3.03	2.95	2.06	2.55	3.70
2.	Number of Days Stock in Hand Ratio	192	201	158	170	120	122	246	111	109
3.	Return per Rupee Invested Ratio	0.24	-0.29	-0.64	-0.59	-0.81	-0.77	-0.63	-0.50	-0.16

Source: Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 7.2

Inventory Turnover Ratio of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	2.08	2.38	1.98	2.29	3.63	4.10	3.26	4.40	5.40
2.	Traco Cable Company Limited	1.91	1.84	2.13	---	4.63	1.10	0.01	0.59	3.66
3.	Transformers and Electricals Kerala Limited	---	2.80	2.10	2.30	2.68	3.32	3.07	2.85	2.89
4.	United Electrical Industries Limited	3.20	2.67	2.71	4.27	3.75	2.87	3.33	4.66	5.69
5.	The Metropolitan Engineering Company Limited	1.09	1.39	---	---	6.29	4.83	5.90	14.69	9.03

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 7.3

Number of Days Stock in Hand Ratio of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	203	136	196	163	105	93	124	96	71
2.	Traco Cable Company Limited	209	169	158	---	156	481	1667	138	113
3.	Transformers and Electricals Kerala Limited	---	235	154	185	116	88	168	121	142
4.	United Electrical Industries Limited	124	139	124	44	156	126	104	82	65
5.	The Metropolitan Engineering Company Limited	325	206	---	---	116	51	68	40	54

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 7.4

Return per Rupee Invested Ratio of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	0.25	0.29	-0.04	0.09	-0.52	0.02	-0.14	-0.07	0.15
2.	Traco Cable Company Limited	0.27	0.42	-0.18	---	-0.14	-0.12	-0.46	0.11	0.06
3.	Transformers and Electricals Kerala Limited	---	-0.51	-0.09	-0.76	-1.01	-1.21	-0.78	-0.73	-0.32
4.	United Electrical Industries Limited	0.22	-0.16	-0.64	-0.94	-0.54	-0.87	-0.97	-0.89	0.26
5.	The Metropolitan Engineering Company Limited	0.13	-1.28	---	---	-1.74	-4.46	-10.51	-1.79	-1.05

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Inventories

In the public sector electrical industry in Kerala, the value of inventory showed an increasing trend from 1980-81 to 1989-90 (Table 7.5 and Figure 7.1). When the investment in inventory rises, the cost of carrying inventory also goes up. Therefore, it is advisable to keep an eye on inventory and its cost in order to keep it under control.

It is also found that the value of inventory increased by 476 per cent during 1989-90 when compared to that of 1980-81. The increasing trend of investment in inventory from 1980-81 to 1989-90 is shown in Figure 7.1.

Table 7.5

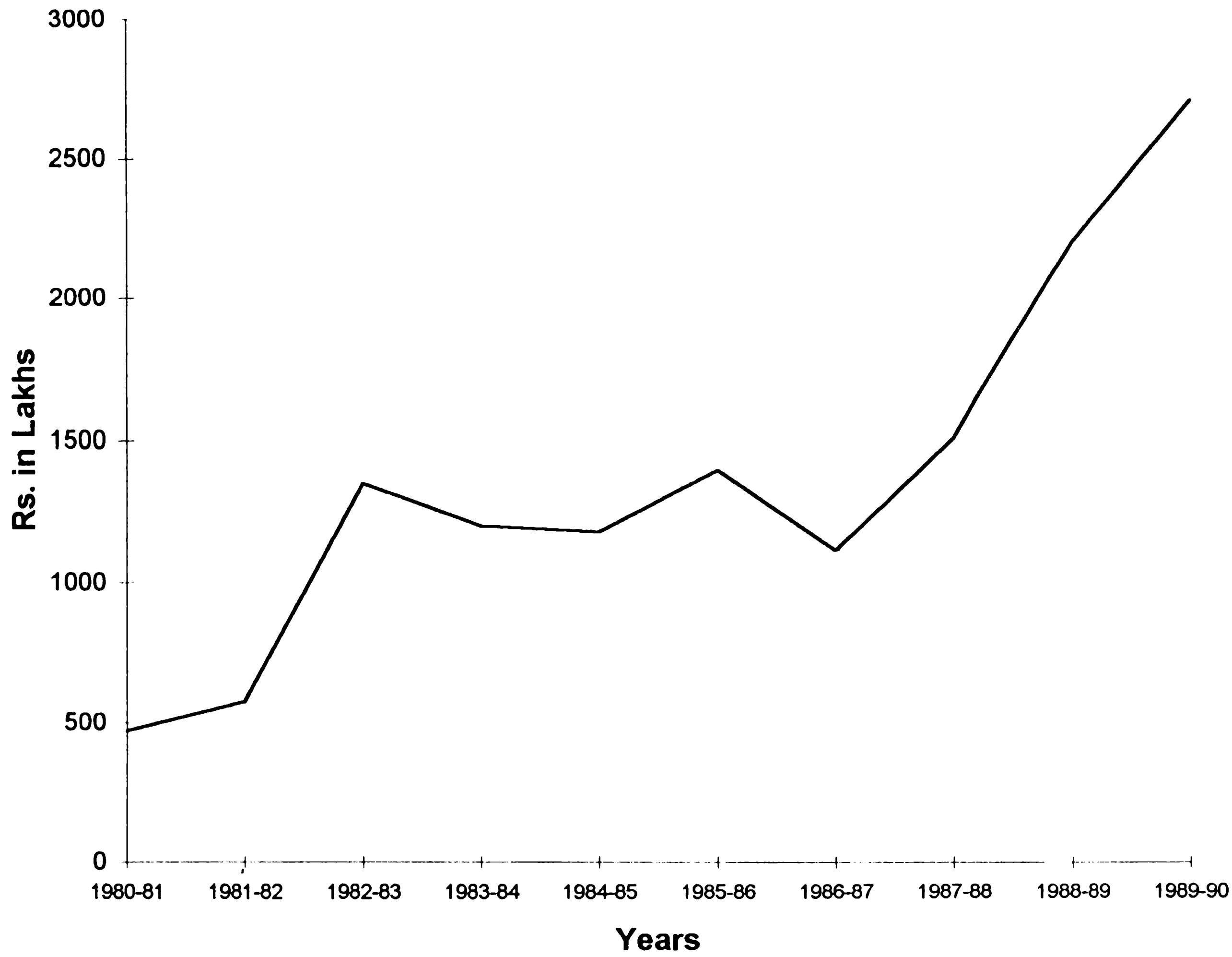
Statement Showing the Value of Inventories of the Public Sector Electrical Industry in Kerala from 1980-81 to 1989-90

Sl. No.	Year	Amount of Inventories (Rs. in lakhs)	Percentage of Change in Inventories
1.	1980-81	468.05	100.00
2.	1981-82	575.03	+23.00
3.	1982-83	1,350.72	+189.00
4.	1983-84	1,199.53	+156.00
5.	1984-85	1,177.78	+152.00
6.	1985-86	1,397.12	+198.00
7.	1986-87	1,110.37	+137.00
8.	1987-88	1,510.31	+223.00
9.	1988-89	2,192.51	+368.00
10.	1989-90	2,697.30	+476.00

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Figure 7.1

Time Series Analysis of Inventories of Public Sector Electrical Industry in Kerala from 1980-'81 to 1989-'90



Raw Materials and Components

The consumption of raw materials and components in the public sector electrical industry in Kerala showed an upward trend from 1980-81 to 1989-90 (Table 7.6). The total material consumption was for Rs.676.33 lakhs during 1980-81 but it reached Rs.5,436.74 lakhs during 1989-90. It is also found that there was a considerable increase in consumption of raw materials and components from 1983-84 to 1989-90. This steep rise in consumption can be counted as a good indicator of increasing production.

Work-in-Progress

Work-in-progress consists of goods that have been started through the manufacturing process but which have not yet been finished.[5] It is computed by taking the sum of the cost of raw materials used along with labour and other manufacturing costs incurred on these items up to the end of the accounting period.

Finished Goods Inventory

Goods in which manufacturing has been completed but the finished product has not been shipped to customers as on the Balance Sheet date.[6] They are calculated at the total cost incurred in manufacturing them.

The value of closing stock of finished goods in the public sector electrical industry in Kerala decreased by Rs.28.14 lakhs during 1983-84 from Rs.368.18 lakhs during 1982-83 and then it increased to Rs.508.56 lakhs during 1984-85 (Table 7.7). This is a sign of wide fluctuation of finished goods stock on account of the inconsistent level of capacity utilisation.

Sales

Most of the activities in an industrial unit are intended to contribute to its profit-seeking objectives. But the volume of profit mainly depends upon the quantum of sales. The amount of sales in the public sector electrical industry in Kerala showed an upward trend from 1980-81 to 1989-90 except during 1983-84 (Table 7.8 and Figure 7.2). The total value of sales was Rs.1,230.28 lakhs during 1980-81 as against Rs.1,310.60 lakhs during 1981-82 showing an increase of seven per cent. During the next eight years the amount of sales increased considerably; 98 per cent, 80 per cent, 102 per cent, 172 per cent, 181 per cent, 219 per cent, 370 per cent and 573 per cent during 1982-83, 1983-84, 1984-85, 1985-86, 1986-87, 1987-88, 1988-89 and 1989-90 respectively.

Table 7.6

Statement Showing the Value of Sales of the Public Sector Electrical Industry in Kerala from 1980-81 to 1989-90

Sl. No.	Year	Amount of Sales (Rs. in lakhs)	Percentage of Change in Sales
1.	1980-81	1,230.28	100.00
2.	1981-82	1,310.60	+7.00
3.	1982-83	2,431.59	+98.00
4.	1983-84	2,215.98	+80.00
5.	1984-85	2,489.43	+102.00
6.	1985-86	3,348.05	+172.00
7.	1986-87	3,454.03	+181.00
8.	1987-88	3,924.09	+219.00
9.	1988-89	5,780.19	+370.00
10.	1989-90	8,283.02	+573.00

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Table 7.7

Statement Showing Raw Material Consumption of Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	214.66	282.59	219.90	195.65	258.57	521.42	596.17	532.15	1,113.52	1,659.21
2.	Traco Cable Company Limited	340.17	232.25	200.85	165.35	—	256.90	217.84	175.28	326.89	597.71
3.	Transformers and Electricals Kerala Limited	—	—	1,053.53	1,132.44	1,576.64	1,585.56	1,248.08	1,861.80	2,475.91	2,709.72
4.	United Electrical Industries Limited	73.19	166.75	149.79	123.33	109.54	131.38	111.32	121.51	186.18	348.10
5.	The Metropolitan Engineering Company Limited	48.31	51.67	22.73	—	—	8.20	5.60	7.85	60.21	122.00
	Total	676.33	733.26	1,646.80	1,616.77	1,944.75	2,503.46	2,179.01	2,698.59	4,162.71	5,436.74

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Table 7.8

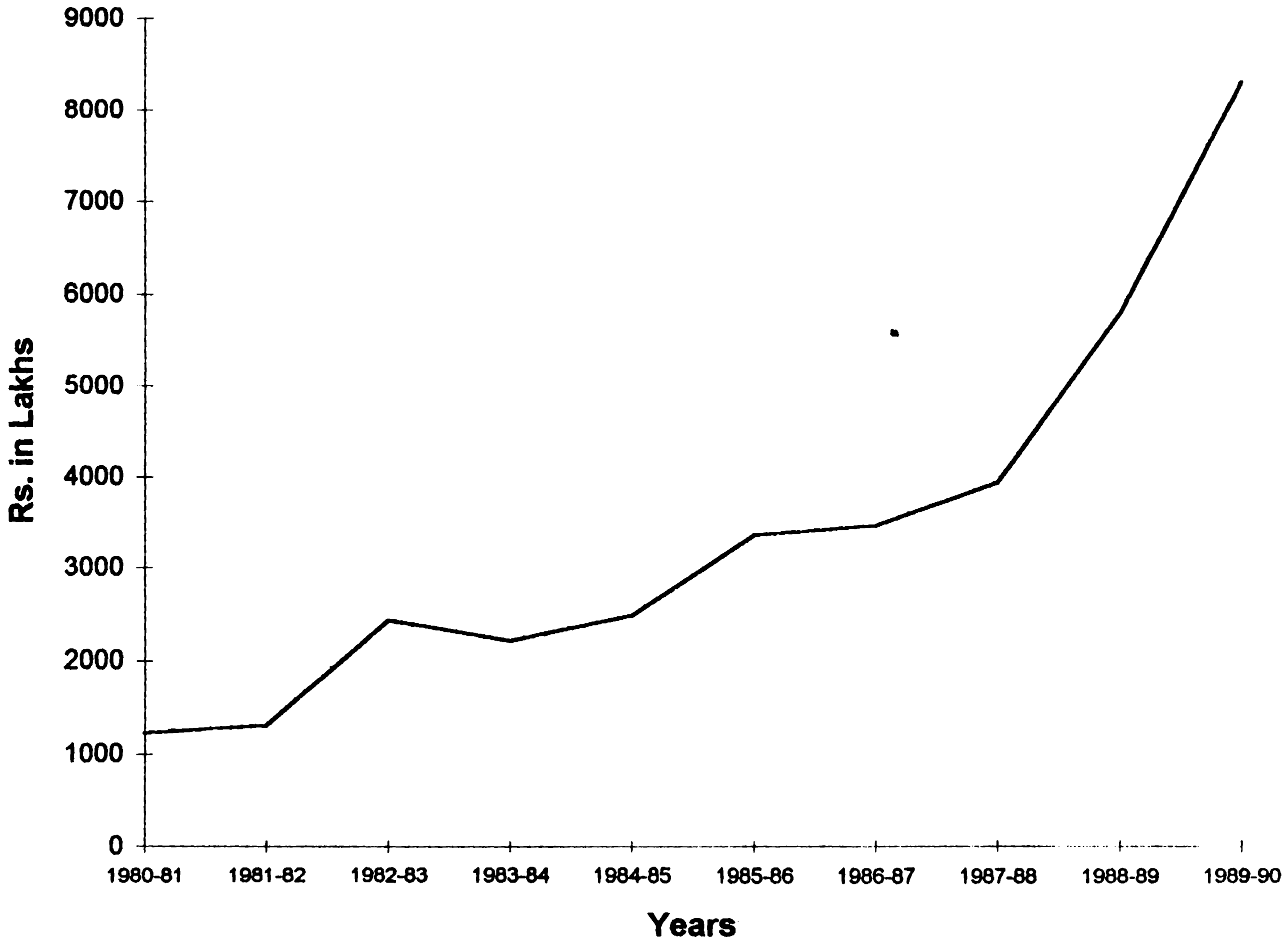
Statement Showing Closing Stock of Work-in-Progress and Finished Goods of Public Sector Electrical Industry in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Item	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Work-in-Progress	62.84	321.35	310.68	179.38	137.21	419.92	1,873.46	757.10	561.92
2.	Finished Goods	129.84	368.18	340.04	508.56	845.60	549.68	730.83	522.80	891.55
	Total	192.68	689.53	650.72	687.94	982.81	969.60	2,604.29	1,279.90	1,453.47

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Figure 7.2
Time Series Analysis of Sales of Public Sector Electrical Industry in Kerala from 1980-'81 to 1989-'90



Notes

[1] Shukla, M.C. and Grewal, T.S., Advanced Accounts (New Delhi: S. Chand and Company Ltd., Ram Nagar, 1986) p.1,285.

[2] Barun K. Sanyal, "Inventory Turnover Ratio: Trapezoidal Rule," Management Accountant, Vol. 23, No. 2 Feb., 1988: p.106.

[3] Jose J. Chamakalay, Management of Working Capital, M.Phil. dissertation Submitted to the University of Kerala 1990: p.124.

[4] ibid., p.123.

[5] Lamar Lee, Jr. and Donald W. Dobler, Purchasing and Materials Management Taxt and Cases (New Delhi: Tata McGraw-Hill Publishing Company Ltd., 1977) p.189.

[6] ibid., p.181.

Chapter VIII

Summary and Conclusions

This study on inventory management in the public sector electrical industry in Kerala has been taken up with the overall objective of evaluating the savings in inventories of electrical products. The specific objectives of the study are:

(1) Get an overall view of the system of inventory management in the public sector electrical industry in Kerala.

(2) Assess the positions and levels of inventory in the electrical undertakings.

(3) Analyse the inventory management policies and practices followed by the electrical undertakings.

(4) Analyse the organisational set-up for materials in the electrical undertakings.

(5) Examine the liquidity of the electrical undertakings.

(6) Examine whether there are any selective and analytical techniques of inventory management in the electrical industry run by the State of Kerala and if so, to analyse its working and management attitudes towards it.

(7) Compare and contrast the inventory policies of one undertaking with those of the others.

(8) Suggest measures based on the findings of the study for the improvement of the working of the system, wherever possible.

The hypotheses formulated for this study are:

(1) The existing organisational set-up, practices and systems are inadequate to ensure efficient management of inventories in electrical industry.

(2) Inventory constitutes the largest proportion of the working capital in electrical undertakings run by the State of Kerala.

(3) Efficiency in management of inventories leads to improvement of profitability of the concern.

(4) Introduction of scientific inventory techniques has a favourable effect on the working of inventory departments.

(5) There is no uniform inventory policy on the working of the material departments of the various electrical undertakings.

(6) The inventory cost of the public sector electrical undertakings in Kerala is much higher than that of the private sector electrical undertakings.

(7) The financial performance of the public sector electrical undertakings is not at all satisfactory on

account of the high raw material costs, heavy borrowings and huge interest burdens.

The present study infers that public sector electrical undertakings in Kerala have achieved a big breakthrough in their performance during the last few years. There are five electrical undertakings established by the State Government. The total investment in these undertakings comes to about Rs.10,569.68 lakhs. Their turnover during 1989-90 was Rs.8,283.02 lakhs with a return of 0.39 per cent on the capital employed. These undertakings provide employment for about 3,521 persons and the total inventory held by them comes to Rs.2,697.30 lakhs.

Inventory forms the largest proportion of the working capital in the public sector electrical undertakings in Kerala. But it is found that the existing organisational set-up and practices are inadequate to ensure efficient management of inventories. The financial performance of these undertakings is not at all satisfactory compared with the private sector electrical industrial units on account of the high raw material cost, heavy borrowings and huge interest burden. In such a situation, the introduction of scientific inventory techniques will have a favourable effect on the working of inventory departments. Hence the functions related to inventories are to be toned up to materialize the object of increased profitability. The materials personnel in these undertakings have also be specially trained and should be made conversant with the modern tools and techniques of inventory management. The status, remuneration and delegation of powers of these personnel should also be adequate to carry out these functions most effectively and efficiently.

In the following pages the conclusions of the study are presented. Suggestions for further study have also been mentioned.

Organisational Set-up for Materials

The study reveals that an integrated organisational set-up for materials department would enable reduction in the overall cost of materials on account of the following reasons:

(1) In the process of converting raw materials into finished products they pass through several stages. All of them are different stages of a single function. In order to make this function efficient and economic, effective co-ordination and control of this flow is essential and a single line of command is necessary.

(2) Low cost of purchases as a result of annual purchase contracts, material substitution and value analysis.

(3) Maximum inventory turnover by regulated ordering, selective inventory control and a staggered material flow.

(4) Minimum shortage with continuous flow of supplies through proper specifications, standardisation and selective inspection of incoming materials.

(5) Reliable sources of supply and cordial relations with the suppliers through prompt payment, proper public relations and periodical discussions on product development.

(6) In an integrated structure, when material or inventory costs or any other costs are out of tune, it is easy to pinpoint the weak link in the material chain and take remedial action in time as there is no dividing line of responsibility.

(7) Integrated set-up resolves conflicts and forces co-ordination between purchasing and production control departments as both these departments report to a single boss—material manager. This improves the capabilities and motivation of personnel resulting in better efficiency and output.

(8) An uninterrupted material flow is highly essential in an automated production. This flow can be achieved only through a streamlined integrated materials set-up.

(9) The recurring shortage of basic raw materials evident in today's economy calls for an integrated material structure as a requirement for business survival.

(10) The make or buy policy decision of an undertaking also necessitates integrated materials structure. When the cost of a product can be reduced, the emphasis is on buying parts rather than making them. This raises the volume of purchases which simultaneously raises the inventory holding.

(11) Integration avoids overlapping of functions and thereby reduces the number of personnel required for the department.

(12) Integration ensures rapid transfer of data through effective and informal communication channel.

The study also reveals that the materials manager who has the overall responsibility for purchasing, production planning, inventory control and distribution and traffic is required to report only to the chief executive.

A central material manager who has co-equal status with those in engineering and production departments enjoys better support and co-operation in the accomplishment of materials function. This creates an atmosphere of trust and better relations between the user departments and materials department.

The concept of integrated materials management has gained greater acceptance only very recently in the field of public sector electrical undertakings in Kerala. Although these undertakings may not adopt a totally integrated approach, there is a definite tendency to move towards the integrated approach. Hence the first hypothesis is accepted.

Working Capital and Inventory

The working capital efficiency in the public sector electrical industry in Kerala is far from satisfactory. The gross current assets of the undertakings form the regular input into the business. These are converted into output which, on being sold, brings in money to the organisation. The liquid portion of the gross figure is utilised for meeting day-to-day business commitments.

The study reveals that inventory constitutes a substantial portion of the current assets in the UEI, where it is between 60 per cent and 70 per cent (Table 4.5). But in all other undertakings inventory constitutes less than 40 per cent of the current assets. Hence the second hypothesis is accepted.

The average inventory held is more than six months' consumption need (Table 4.6). The average current ratio is 1.5:1 while in the KEL it is significantly higher figure. Thus it can be inferred that as the quick ratio increases the credibility of the concern will also increase. This is because the trade creditors will feel more secure about the amounts they have extended. As the value of quick ratio can be increased by decreasing the inventories, better inventory management increases credibility and liquidity.

The Gross Operating Cycle showed a diminishing trend from 1981-82 to 1989-90 except during 1983-84 and 1987-88 (Table 4.11). This was due to steep rise of work-in progress conversion period and the increase of book debts conversion period during 1983-84 and 1987-88 (Table 4.15). The net operating cycle showed an increasing trend up to 1984-85 and it became negative afterwards. This was on account of the decreasing trend of the payment deferral period from 1985-86 to 1989-90 (Table 4.16).

In the light of the analysis of the operating cycle, it is found that inventory in the form of raw materials and stores, work-in-progress and finished goods contributes to more than 80 per cent of the total period of the operating cycle. It follows at once that with a given quantum of working capital, the turnover rate can be increased by reducing any one or more of the four components of the cycle. While credit availability and collection period depend on external market conditions, better inventory management leads to reduction of the time in the storage periods. Hence the performance of the organisation can be improved by better internal management itself.

Some Concepts about Inventories

Having analysed the sales of the undertakings, it is found that direct materials and indirect materials forming part of the overhead cost, constituting inventories, account for a large percentage of total cost. The various costs relating to materials are; cost of ordering, cost of carrying inventory, understocking cost and overstocking cost. The major component of ordering cost is salary. In order to control this, the number of men in purchasing should be kept as low as possible. Hence any jump in the total salary should not be allowed unless there is a corresponding increase in the number of orders. It will be cheaper to use overtime when there is a marginal increase in the number of orders.

The inventory carrying cost comes around 30 per cent of the average inventory held. This can be reduced further through the disposing of surplus inventories and adopting modern techniques of inventory management.

The study asserts that both overstocking and understocking of inventories are costly to the concern. Hence it is necessary to balance one against the other through continuous checking.

The analysis also shows that there is direct relationship between lead time and inventories of the concern. When lead time increases the inventories will have to increase correspondingly. Of the various components of lead time, it is found that the procurement or manufacturing lead time is the toughest nut to crack. This should be taken care of while negotiating order and supply details. Administrative and inspection lead time are under the control of the purchaser. Transportation lead time can be reduced by a cost trade off but not below a threshold.

It is also found that the productivity aspect of inventory is often overlooked or is not adequately looked after in most of the concerns. This aspect is positively rewarding in large measures because inventory is the largest co-partner in the total cost partnership. Hence the third hypothesis is accepted. Hence the third hypothesis is accepted.

A number of techniques are found to be designed and applied in the area of material control. These techniques have spread over all the key areas of inventory management. They range from planning of raw materials to despatching of finished goods to consumer. But it is a tough job to direct the control on material cost at every point.

Tools and Techniques of Inventory Management

The study reveals that the decisions as to which item to make and when to keep inventories in balance require application of a wide range of techniques from simple graphical methods to more sophisticated and complex quantitative techniques. The public sector electrical undertakings in Kerala have adopted certain efficient techniques like A.B.C. analysis, perpetual inventory system etc., for controlling their inventories. But control measures such as E.O.Q. and fixing of material stock levels are not strictly adhered to resulting in a high inventory cost. With the advent of Electronic Data Processing (EDP), better selective inventory control measures are available the adoption of which may lead to better control of inventory at a reduced cost. Hence the fourth hypothesis is accepted.

A significant fact the study brings to light is that although a major portion of inventory in these undertakings required for production consists of stores and spares, control techniques like VED (Vital, Essential, Desirable) analysis have not so far been adopted. ABC analysis can be combined with VED analysis for control of spare parts inventory. This combination enables a widespread scrutiny for proper provisioning of spare parts. SDE (Scarce, Difficult, Easy) analysis conjoining with HML (High, Medium, Low) analysis will yield suitable guideline for fixing stock levels relating to short supply items. FSN (Fast, Slow, Non-moving) analysis helps weed out the non-moving items and in disposal planning of scraps which too calls for distinct and serious attention.

The study also reveals that no public sector electrical undertaking in Kerala has applied computer for inventory control and other decision making purposes. With mechanisation of industry no modern techniques will be cumbersome in application or time consuming; nor will they be superfluous. It has often been found difficult to control Local Purchases (LP) of materials. Once the repair and maintenance spare parts are out of stock, one cannot obviously wait for the materials management department to make orders in lots of indents based upon their convenience. But with the help of computers it is possible to control LP and associated disadvantage of lacking economics of scale.

It is found in the study that there is a need to improve the work environment before a full-fledged just-in-time inventory system can be implemented. But the spares and other inventory items which are readily available from the local market could be better managed by the JIT approach of buying. JIT enables the managers to run the project with ready stock and no associated carrying cost.

The analysis also reveals the need for an inventory audit as the inventory and its movement towards production and marketing and the costs involved in are very high. Like internal audit, inventory audit should also be made the routine feature of the undertakings. It may be done with the required qualified hands within the organisation or by outside inventory audit teams. During inventory audit the items like raw materials, work-in-progress, finished goods, stores and spares, loose tools and others and by-products and scraps should be audited with due care to effect economy in the organisation. Hence the fifth hypothesis is accepted.

Inventory Ratios

The study reveals that the value of inventory in the public sector electrical industry in Kerala showed an increasing trend from 1980-81 to 1989-90 (Table 7.5). But the per cent of inventories to current assets decreased by 5.82 during 1989-90 when compared to that of 1980-81 (Table 4.1). Therefore, it is advisable to keep an eye on inventory and its costs in order to keep it under control.

The consumption of raw materials showed a considerable increase from 1980-81 to 1989-90 (Table 7.6). The total consumption of raw material was for Rs.676.33 lakhs during 1980-81 whereas it increased to Rs.5436.74 lakhs during 1989-90. This can be counted as a good indicator of increasing production. But the per cent of inventories to consumption of raw materials decreased by 19.59 during 1989-90 from that of 1980-81.

The value of closing stock of finished goods decreased by Rs.28.14 lakhs during 1983-84 from Rs.368.18 lakhs during 1982-83 and then it increased to Rs.508.56 lakhs during 1984-85 (Table 7.7). This is a sign of wide fluctuation of finished goods inventory on account of the inconsistent level of capacity utilisation.

The amount of sales showed an upward trend from 1980-81 to 1989-90 except during 1983-84 (Table 7.8). This implies a good market condition and high profitability. But the per cent of inventories to sales decreased by 5.48 during 1989-90 from that of 1980-81.

The study also reveals that the inventory turnover ratio increased by 1.60 during 1989-90 (i.e., 3.70) from that of 1981-82 (i.e., 2.10) (Table 7.1). It implies a more efficient use of inventory and a reduction in working capital needs.

The number of days stock in hand is around 140 in the public sector electrical industry in Kerala (Table 7.1). This ratio showed a diminishing trend year by year in the industrial units except in the Traco Cable Company Limited during 1986-87 and 1987-88. This is a sign of increasing efficiency in selling the goods and inventory management.

The return per rupee invested is around (-)0.50, i.e., negative, in the public sector electrical industry in Kerala (Table 7.1). This ratio showed a diminishing trend year by year in the industrial units except in the Traco Cable Company Limited during 1988-89 and 1989-90 and in the United Electrical Industries Limited during 1989-90.

This is an indication of decreasing efficiency in management of inventories in terms of profitability. Hence the sixth and seventh hypotheses are accepted.

Policy Implications

The total activity of the materials department in the public sector electrical undertakings in Kerala must be integrated under one senior manager with the same status as other departmental heads. This helps to obtain meaningful economy, efficiency and savings from the material organisation. This particular aspect is fully neglected in most of the undertakings analysed.

The reputation and performance of an undertaking mainly depend on the people who manage and control it. So persons who deal with the inventories should be carefully selected, oriented, trained and developed. They should have the basic qualifications which would enable them to know about the materials bought and the process through which they are put. They must be specially trained conversant with the modern tools and techniques of inventory management. This is highly essential to enhance their talent and skill in creative buying and decision making. The status, remuneration and delegation of powers of these personnel should also be adequate to carry out the functions effectively and efficiently.

Material managers in most of these undertakings lack some of the requirements and hence special attention is required in training, development and delegation.

The working capital efficiency in the public sector electrical undertakings in Kerala is far from satisfactory. Its requirement depends basically on the length of the operating cycle. Monitoring the cycle thus becomes an important task of the working capital control. In this context the following facts should be kept in mind:

(1) The duration of the raw materials and stores stage depends on the regularity of supply, lead time, degree of persistability, price variations and economics of bulk purchases.

(2) The duration of the work-in-progress stage depends on the duration of production cycle and efficient co-ordination of various inputs.

(3) The duration of the finished goods stage depends on the method of production and sales. If production is fairly uniform throughout the year but sales are mainly seasonal or vice versa, the duration of the finished goods stage tends to be long.

(4) The duration of the receivable stage depends on the credit period allowed to customers, cash discount and credit, and collection policy of the undertaking.

It is found that in the public sector electrical undertakings in Kerala direct materials and indirect materials forming part of the overhead cost, constituting inventories account for a large percentage of total cost. Thus these undertakings cannot simply forget the area of materials and think of surviving in the market. At the same time it is a tough job to direct the control on material at every point. So special attention should be paid to point out the important areas where the possibility of loss is more.

It is also found that the productivity aspect of inventory is not adequately looked after in most of the undertakings. In fact productivity reduces the cost of input and dramatic results can be achieved through better management. So special attention should also be paid to the productivity aspect of inventory.

Internal and external lead time must be improved through proper delegation, responsibility, authority and accountability of the material personnel. Special care should be taken while negotiating the order and supply details for controlling procurement or manufacturing lead time which is a tough task. There is further scope for savings in procurement through cost analysis and negotiation which are not practised at present.

The quantity ordered of different high cost materials is not consistent in most of the undertakings. So it is advisable to follow an economic order quantity technique for these items.

At present, enough attention is not being paid to inventory levels in most of the undertakings. These levels can be reduced further by the use of modern techniques of selective control, just-in-time inventory system, computers and inventory audit.

The turnover ratio in most of the undertakings is also not attractive. This ratio can also be increased if special attention is paid to bring down the level of inventories and prompt action is taken for the disposal of surplus and obsolete items.

Where the aforesaid recommendations are implemented in the public sector electrical undertakings in Kerala the following annual savings are fairly ensured.

When there is an inventory investment of Rs.3,000.00 lakhs in the public sector electrical undertakings in Kerala, a saving of 20 per cent of this value is highly attractive and worthwhile.

Sl. No.	Details	Extent of Saving as percentage of inventory value
1.	Saving through functional integration	4
2.	Economy through improved efficiency of personnel by proper orientation, training, development, delegation and authority	2
3.	Saving through efficient management of working capital	6
4.	Saving through the concentration of attention in important areas of materials where the possibility of loss is more	2
5.	Saving through the concentration of efforts on the productivity aspect of inventory	2
6.	Saving through the reduction of lead time of inventory	2
7.	Saving from purchasing through Economic Order Quantity	4
8.	Saving from reduction of inventory levels through better turnover, selective inventory control, JIT, application of computers and inventory audit	6
	Total	28
	Less: Expenses for setting up of special cells for specific action, personnel efforts and other incidentals	8
	Net saving assessed	20*

* 20 per cent of the inventory value.

Suggestions for Further Study

The new developments in the area of inventory management assume greater significance on account of the huge value of working capital invested in inventories. A further study is, therefore, essential to assess the impact of these suggestions and improvements.

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Appendix 3.1

Net State Domestic Product and Per Capita Income of Kerala at Factor Cost by Industry of Origin at Current Prices (New Series)

(Rs. in lakhs)

Industry of Origin	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90 (P)	1990-91 (Q)	1991-92 (A)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Agriculture	129334	131163	153826	199323	214908	203536	234710	261685	304092	331460	333462	356804
Forestry & Logging	12382	8048	14364	8097	8448	9018	9872	7170	5694	5238	13068	14375
Fishing	7743	6292	7923	8938	8942	11777	12104	12410	20397	25700	22666	26293
Mining & Quarrying	461	640	754	690	1014	920	912	1159	1287	1430	3156	3999
Sub Total—Primary	149970	146143	176867	217048	233312	225251	257598	282424	331470	363828	372352	401471
Manufacturing	53152	61585	71171	75013	79448	86335	90178	106083	116474	128236	171948	197323
Registered	29030	33461	36610	41755	45368	47610	48892	68454	78085	89072	129541	153338
Un-registered	24122	28124	34561	33258	34080	38725	41286	37629	38389	39164	42407	43985
Electricity, Gas & Water Supply	5509	3647	2797	1785	4345	2411	5981	3493	4658	6332	5436	7383
Electricity	5077	3111	2293	1102	3772	1363	4305	1526	2374	3693	2572	4096
Gas	85	95	101	109	125	510	970	1030	1151	1269	1479	1696
Water Supply	347	441	403	574	448	538	706	937	1133	1370	1385	1591
Construction	34496	38427	42657	52889	60378	77439	76657	82617	94704	108559	120927	136442
Sub Total—Secondary	93157	103659	116625	129687	144171	166185	172816	192193	215836	243127	298311	341148
Transport, Storage & Communication	13625	14725	18781	23676	32009	37448	44678	56718	63785	76507	80110	90163
Railways	419	835	1010	1181	1039	1529	1898	2967	3106	3976	4183	4206
Transport by Other Means & Storage	10770	11482	14769	18976	26838	31446	37016	47032	51376	60624	57792	61837
Communication	2436	2408	3002	3519	4132	4473	5764	6719	9303	11907	18135	24120
Trade, Hotel & Restaurants	57577	55856	64789	75712	81980	82360	100046	108439	113444	121385	164926	186366
Banking & Insurance	11428	16206	19803	22873	27198	31424	38455	41146	47196	54275	65735	75575
Real Estate Ownership & Dwellings	12198	12359	13152	12868	13159	10463	9055	7572	6917	6142	2010	1367
Public Administration	15133	16873	17489	19259	25191	30806	39146	44417	48224	55940	59258	65766
Other Services	29766	34982	38713	45392	50808	59704	70241	77379	86643	96174	107175	118964
Sub Total—Tertiary	139727	151001	172727	199780	230345	252205	301621	335671	366209	410423	479214	538201
Net Domestic Product	382854	400803	466219	546515	607828	643641	732035	810288	913515	1017378	1149877	1280820
Population ('000)	25312	25709	26170	26658	27157	27648	28126	28589	29041	29482	29918	30348
Per Capital Income (Rs.)	1513	1559	1782	2050	2238	2328	2603	2834	3146	3451	3843	4220

Income figures from 1981-82 to 1989-90 are to be revised. P = Provisional Estimates; Q = Quick Estimates; A = Anticipated.

Source: Department of Economics and Statistics.

Appendix 3.2

Net State Domestic Product and Per Capita Income of Kerala at Factor Cost by Industry of Origin at Constant Prices (New Series)

(Rs. in lakhs)

Industry of Origin	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90 (P)	1990-91 (Q)	1991-92 (A)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Agriculture	129384	130483	128638	118576	131975	137924	130949	136601	163898	173732	174600	185076
Forestry & Logging	12382	7283	8832	5288	4749	4507	4389	3072	2067	1695	4496	5395
Fishing	7743	5797	6958	7691	6764	7042	5917	5325	7495	7795	6635	6701
Mining & Quarrying	461	590	481	345	540	496	647	525	583	648	2141	2712
Sub Total—Primary	149970	144153	144909	131900	144028	149969	141902	145523	174043	183870	187872	199884
Manufacturing	53152	57178	62187	58565	56916	58480	52345	56440	59783	63790	82266	94008
Registered	29030	31028	32324	32388	30865	31114	25442	35072	39639	44800	64448	75527
Un-registered	24122	26150	29863	26177	26051	27366	26903	21368	20144	18990	17818	18481
Electricity, Gas & Water Supply	5509	3394	2438	1354	2928	1558	3198	1894	2455	3250	2829	3769
Electricity	5077	2885	2025	855	2566	891	2240	782	1205	1857	1258	1973
Gas	85	84	87	95	97	394	653	692	775	856	968	1110
Water Supply	347	425	326	404	265	273	305	420	475	537	603	686
Construction	34496	31495	28944	31405	31509	35732	33176	31876	35692	39962	43127	47470
Sub Total—Secondary	93157	92067	93569	91324	91353	95770	88719	90210	97930	107002	128222	145247
Transport, Storage & Communication	13625	14271	14832	15691	18644	21034	22219	24013	24275	25452	27286	28613
Railways	419	646	629	686	705	836	807	872	812	816	893	900
Transport by Other Means & Storage	10770	10841	11352	11879	14717	16967	17966	19538	19755	20743	21779	22868
Communication	2436	2784	2851	3126	3222	3231	3446	3603	3708	3893	4614	4845
Trade, Hotel & Restaurants	57577	53063	55197	52110	55804	56480	55522	57178	56017	55849	61201	61507
Banking & Insurance	11428	12098	13654	14914	16867	19193	21966	22630	24856	27093	33132	35451
Real Estate Ownership & Dwellings	12198	12166	12567	12178	11840	9011	7639	6324	5777	5026	4632	4447
Public Administration	15133	15375	17005	17515	19267	20208	22889	25269	27435	30453	32595	35529
Other Services	29766	30282	30890	31497	31980	32507	32953	33558	34095	35800	35460	36169
Sub Total—Tertiary	139727	137255	144145	143905	154402	158433	163188	168972	172455	179673	194306	201716
Net Domestic Product	382854	373475	382623	367129	389783	404172	393809	404705	444428	470545	510400	546847
Per Capital Income (Rs.)	1513	1453	1462	1377	1435	1462	1400	1416	1530	1596	1706	1802

Income figures from 1981-82 to 1989-90 are to be revised. P = Provisional Estimates; Q = Quick Estimates; A = Anticipated.

Source: Department of Economics and Statistics.

Appendix 4.1

"Inventories" of Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	196.07	270.05	200.16	235.45	247.41	243.81	260.40	357.10	557.84	607.49
2.	Traco Cable Company Limited	144.89	157.28	133.17	114.18	---	134.19	140.23	112.94	201.92	257.47
3.	Transformers and Electricals Kerala Limited	---	---	866.07	751.42	837.43	905.41	603.44	945.85	1310.69	1688.86
4.	United Electrical Industries Limited	96.47	107.17	120.23	98.48	92.94	100.66	99.61	91.21	103.90	109.38
5.	The Metropolitan Engineering Company Limited	30.62	44.53	31.09	---	---	13.05	6.69	3.21	18.16	34.10
	Total	468.05	575.03	1350.72	1199.53	1177.78	1397.12	1110.37	1510.31	2192.51	2697.30

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Appendix 4.2

"Material Consumption" of Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	214.66	282.59	219.90	195.65	258.57	521.42	596.17	532.15	1113.52	1659.21
2.	Traco Cable Company Limited	340.17	232.25	200.85	165.35	---	256.90	217.84	175.28	326.89	597.71
3.	Transformers and Electricals Kerala Limited	---	---	1053.53	1132.44	1576.64	1585.56	1248.08	1861.80	2475.91	2709.72
4.	United Electrical Industries Limited	73.19	166.75	149.79	123.33	109.54	131.38	111.32	121.51	186.18	348.10
5.	The Metropolitan Engineering Company Limited	48.31	51.67	22.73	---	---	8.20	5.60	7.85	60.21	122.00
	Total	676.33	733.26	1646.80	1616.77	1944.75	2503.46	2179.01	2698.59	4162.71	5436.74

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Appendix 4.3

"Production" of Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	443.71	611.81	538.14	469.05	602.54	933.72	1141.39	1040.16	1982.32	2934.90
2.	Traco Cable Company Limited	452.42	356.58	337.38	233.90	---	365.80	311.41	247.15	502.74	781.60
3.	Transformers and Electricals Kerala Limited	---	---	1365.34	1305.70	1888.66	2044.45	1465.90	2595.00	3316.69	3969.23
4.	United Electrical Industries Limited	283.09	325.78	270.60	196.64	177.07	247.20	199.39	216.54	339.54	597.86
5.	The Metropolitan Engineering Company Limited	82.92	83.59	24.85	---	---	17.23	17.94	10.37	102.89	171.00
	Total	1262.14	1377.76	2536.31	2205.29	2668.27	3608.40	3336.03	4109.22	6244.18	8454.59

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Appendix 4.4

"Sales" of Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	434.76	553.84	594.02	448.26	578.87	814.06	1167.47	1030.05	1885.33	2994.85
2.	Traco Cable Company Limited	449.11	352.49	343.22	242.49	---	366.67	316.96	250.31	486.79	758.00
3.	Transformers and Electricals Kerala Limited	---	---	1202.18	1321.45	1737.26	1900.35	1757.53	2412.00	2965.08	3766.01
4.	United Electrical Industries Limited	276.39	325.48	258.15	203.78	173.30	248.64	194.22	221.36	343.98	603.26
5.	The Metropolitan Engineering Company Limited	70.02	78.79	34.02	---	---	18.33	17.85	10.37	99.01	160.90
	Total	1230.28	1310.60	2431.59	2215.98	2489.43	3348.05	3454.03	3924.09	5780.19	8283.02

ource: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Appendix 4.5

"Current Assets" of Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	401.81	559.68	555.07	580.76	651.94	731.61	844.04	936.86	1495.69	1802.51
2.	Traco Cable Company Limited	379.87	393.08	393.22	393.49	---	337.92	510.04	215.36	556.62	606.96
3.	Transformers and Electricals Kerala Limited	---	---	2031.72	1841.00	1886.45	1921.54	1524.51	2322.07	3134.64	3664.68
4.	United Electrical Industries Limited	140.86	179.33	169.40	134.99	121.87	144.12	155.66	132.04	176.66	183.61
5.	The Metropolitan Engineering Company Limited	50.62	69.75	47.41	---	---	28.10	20.99	15.51	108.86	122.00
	Total	973.16	1201.84	3196.82	2950.24	2660.26	3163.29	3055.24	3621.84	5472.47	6379.76

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Appendix 4.6

"Current Liabilities" of Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	170.13	196.17	173.67	177.51	181.93	194.08	190.80	181.37	582.77	884.77
2.	Traco Cable Company Limited	141.75	148.73	130.34	112.80	---	119.07	101.63	93.38	238.23	250.77
3.	Transformers and Electricals Kerala Limited	---	---	1233.38	1357.86	1773.31	1425.59	1490.94	1457.28	3909.84	3959.66
4.	United Electrical Industries Limited	39.28	39.50	42.26	48.68	70.85	79.86	99.28	116.52	316.26	263.49
5.	The Metropolitan Engineering Company Limited	17.61	19.55	24.57	---	---	22.07	27.85	24.08	223.42	240.34
	Total	368.77	403.95	1604.22	1696.85	2026.09	1840.67	1910.50	1872.63	5270.52	5599.03

Source: Government of Kerala, _Review of Public Enterprises in Kerala_ (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Appendix 4.7

"Short-Term Bank Borrowings" of Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	390.62	452.37	394.79	425.20	553.20	175.36	232.54	255.25	378.00	512.62
2.	Traco Cable Company Limited	130.33	117.37	81.61	---	---	---	68.52	83.19	129.74	139.02
3.	Transformers and Electricals Kerala Limited	---	---	1790.39	2229.83	2330.58	863.77	832.46	1492.64	1842.70	1906.42
4.	United Electrical Industries Limited	93.93	99.00	96.36	115.80	155.61	127.87	118.85	115.40	150.68	112.15
5.	The Metropolitan Engineering Company Limited	85.87	97.46	104.18	---	---	96.25	111.95	131.30	159.48	175.34
	Total	700.75	766.20	2467.33	2770.83	3194.96	1263.25	1364.32	2077.78	2660.60	2845.55

urce: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

Appendix 4.8

"Opening Stock of Raw Materials" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	120.94	137.57	123.95	138.69	130.54	106.65	132.27	219.11	200.23
2.	Traco Cable Company Limited	129.05	157.28	119.09	108.69	---	50.99	60.04	39.59	115.42
3.	Transformers and Electricals Kerala Limited	---	---	512.39	399.65	666.08	211.54	202.80	357.79	418.50
4.	United Electrical Industries Limited	70.24	81.75	68.21	61.49	---	77.05	70.70	66.96	74.09
5.	The Metropolitan Engineering Company Limited	52.23	44.53	31.09	---	---	13.05	6.69	2.96	10.45
	Total	372.46	421.13	854.73	648.52	796.62	459.28	772.50	686.41	818.69

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 4.9

"Closing Stock of Raw Materials" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	137.57	123.95	138.69	130.54	106.65	132.27	219.11	200.23	321.76
2.	Traco Cable Company Limited	157.28	119.09	108.69	---	50.99	60.04	39.59	115.42	145.45
3.	Transformers and Electricals Kerala Limited	---	512.39	399.65	666.08	211.54	202.80	357.79	418.50	593.87
4.	United Electrical Industries Limited	81.75	68.21	61.49	---	77.05	70.70	66.96	74.09	81.50
5.	The Metropolitan Engineering Company Limited	44.53	31.09	---	---	13.05	6.69	2.96	10.45	15.00
	Total	421.13	854.73	648.52	796.62	459.28	772.50	686.41	818.69	1157.58

ource: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 4.10

"Total Materal Consumption" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	282.59	219.90	195.65	258.57	521.42	596.17	532.15	1113.52	1659.21
2.	Traco Cable Company Limited	232.25	200.85	165.35	---	256.90	217.84	175.28	326.89	597.71
3.	Transformers and Electricals Kerala Limited	---	1053.53	1132.00	1576.64	1585.56	1248.08	1861.80	2475.91	2709.72
4.	United Electrical Industries Limited	166.75	149.79	123.33	109.54	131.38	111.32	121.51	186.18	348.10
5.	The Metropolitan Engineering Company Limited	51.67	22.73	---	---	8.20	5.60	7.85	60.21	122.00
	Total	733.26	1646.80	1616.33	1944.75	2503.45	2179.01	2698.59	4262.71	5436.74

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 4.11

"Opening Stock of Work-in-Progress" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	37.47	56.06	34.18	40.68	41.95	29.40	40.95	25.66	117.10
2.	Traco Cable Company Limited	---	---	---	---	---	107.62	370.13	1333.33	47.24
3.	Transformers and Electricals Kerala Limited	---	---	275.29	259.54	128.68	---	8.65	514.09	581.73
4.	United Electrical Industries Limited	2.56	6.78	11.88	10.46	8.75	0.19	0.19	0.20	7.41
5.	The Metropolitan Engineering Company Limited	---	---	---	---	---	---	---	0.18	3.62
	Total	40.03	62.84	321.35	310.68	179.38	137.21	419.21	1873.46	751.10

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 4.12

"Closing Stock of Work-in-Progress" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	56.06	34.18	40.68	41.95	29.40	40.95	25.66	117.10	83.28
2.	Traco Cable Company Limited	---	---	---	---	107.62	370.13	1333.33	47.24	55.04
3.	Transformers and Electricals Kerala Limited	---	275.29	259.54	128.68	---	8.65	514.09	581.73	411.02
4.	United Electrical Industries Limited	6.78	11.88	10.46	8.75	0.19	0.19	0.20	7.41	9.58
5.	The Metropolitan Engineering Company Limited	---	---	---	---	---	---	0.18	3.62	3.00
	Total	62.84	321.35	310.68	179.38	137.21	419.92	1873.46	757.10	561.92

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 4.13

"Total Cost of Production" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	562.47	499.47	472.14	589.09	773.60	946.81	884.97	1697.64	2528.54
2.	Traco Cable Company Limited	311.88	282.91	231.00	---	339.50	291.78	231.95	425.82	697.95
3.	Transformers and Electricals Kerala Limited	---	1847.07	2097.05	2723.88	2083.34	1688.60	2384.37	3113.13	3365.11
4.	United Electrical Industries Limited	306.32	295.29	262.35	265.79	251.15	226.76	247.95	350.43	502.81
5.	The Metropolitan Engineering Company Limited	91.51	59.93	---	---	22.12	18.25	8.47	89.02	152.75
	Total	1272.18	2984.67	3062.54	3578.76	3469.71	3172.20	3757.71	5676.04	7247.16

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 4.14

"Opening Stock of Finished Goods" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	37.66	76.42	42.03	56.08	74.92	134.57	121.23	123.87	188.46
2.	Traco Cable Company Limited	15.83	19.92	14.08	5.49	---	6.03	9.92	10.00	13.07
3.	Transformers and Electricals Kerala Limited	---	112.13	275.79	259.54	410.94	683.74	392.11	575.11	303.67
4.	United Electrical Industries Limited	13.32	13.62	26.07	18.93	22.70	21.26	26.42	21.60	17.16
5.	The Metropolitan Engineering Company Limited	15.08	19.88	---	---	---	---	---	0.25	0.44
	Total	81.89	241.97	357.97	340.04	508.56	845.60	549.68	730.83	522.80

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 4.15

Goods" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
76.42	42.03	56.08	74.92	134.57	121.23	123.87	188.46	162.33
19.92	14.08	5.49	---	6.03	9.92	10.00	13.07	28.87
---	275.29	259.54	410.94	683.74	392.11	575.11	303.67	677.40
13.62	26.07	18.93	22.70	21.26	26.42	21.60	17.16	11.85
19.88	10.71	---	---	---	---	0.25	0.44	11.10
129.84	368.18	340.04	508.56	845.60	549.68	730.83	522.80	891.55

:ala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises,
).

Appendix 4.16

"Opening Debtors" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	157.77	226.57	296.47	245.48	260.34	266.69	396.48	325.05	479.50
2.	Traco Cable Company Limited	164.45	133.34	136.64	109.93	---	88.88	119.47	58.18	169.52
3.	Transformers and Electricals Kerala Limited	---	---	968.87	913.27	894.10	1011.60	918.55	1373.86	1470.31
4.	United Electrical Industries Limited	40.24	56.98	32.88	26.78	19.87	34.74	41.93	19.23	51.61
5.	The Metropolitan Engineering Company Limited	16.29	20.17	11.03	---	---	14.85	14.05	12.25	55.75
	Total	378.75	437.06	1445.89	1295.46	1174.31	1416.76	1490.48	1788.57	2226.69

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 4.17

"Closing Debtors" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	226.57	296.47	245.48	260.34	266.69	396.48	325.05	479.50	810.27
2.	Traco Cable Company Limited	113.34	136.64	109.93	---	88.88	119.47	58.18	169.52	204.86
3.	Transformers and Electricals Kerala Limited	---	968.87	913.27	894.10	1011.60	918.55	1373.86	1470.31	1595.89
4.	United Electrical Industries Limited	56.98	32.88	26.78	19.87	34.74	41.93	19.23	51.61	63.75
5.	The Metropolitan Engineering Company Limited	20.17	11.03	---	---	14.85	14.05	12.25	55.75	68.91
	Total	437.06	1445.89	1295.46	1174.31	1416.76	1490.48	1788.57	2226.69	2743.68

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 4.18

"Total Cost of Goods Sold" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	485.10	535.56	438.20	554.46	940.90	1160.02	1082.04	1925.80	2901.54
2.	Traco Cable Company Limited	309.03	286.94	263.97	---	385.78	333.98	302.79	464.28	742.22
3.	Transformers and Electricals Kerala Limited	---	1650.93	2016.85	2376.51	2821.66	2490.89	3151.37	3926.59	4321.23
4.	United Electrical Industries Limited	301.84	278.27	267.31	261.22	303.32	281.33	310.14	437.42	574.23
5.	The Metropolitan Engineering Company Limited	72.30	73.92	---	---	41.06	47.71	44.13	131.53	197.01
	Total	1168.27	2825.62	2986.33	3192.19	4492.72	4313.93	4890.47	6885.62	8736.23

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 4.19

"Opening Creditors" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	170.13	196.17	173.67	177.51	181.93	194.08	190.80	181.07	55.31
2.	Traco Cable Company Limited	141.75	148.73	130.34	112.80	---	119.07	101.63	93.38	24.61
3.	Transformers and Electricals Kerala Limited	---	---	1233.38	1357.86	1773.31	1425.59	1490.94	1457.28	585.34
4.	United Electrical Industries Limited	39.28	39.50	42.26	48.68	70.85	79.86	99.28	116.52	19.37
5.	The Metropolitan Engineering Company Limited	17.61	19.55	24.57	---	---	22.07	27.85	24.08	44.00
	Total	368.77	403.95	1604.22	1696.85	2026.09	1840.67	1910.50	1872.33	728.63

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 4.20

"Closing Creditors" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	196.17	173.67	177.51	181.93	194.08	190.80	181.37	55.31	95.02
2.	Traco Cable Company Limited	148.73	130.34	112.80	---	119.07	101.63	93.38	24.61	37.93
3.	Transformers and Electricals Kerala Limited	---	1233.38	1357.86	1773.31	1425.59	1490.94	1457.28	585.34	683.28
4.	United Electrical Industries Limited	39.50	42.26	48.68	70.85	79.86	99.28	116.52	19.37	17.15
5.	The Metropolitan Engineering Company Limited	19.55	24.57	---	---	22.07	27.85	24.08	44.00	44.00
	Total	403.95	1604.22	1696.85	2026.09	1840.67	1910.50	1872.63	728.63	877.38

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 4.21

"Total Credit Purchases" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	196.17	173.67	177.51	181.93	194.08	190.80	181.37	55.31	95.02
2.	Traco Cable Company Limited	148.73	130.34	112.80	---	119.07	101.63	93.38	24.61	37.93
3.	Transformers and Electricals Kerala Limited	---	1233.38	1357.86	1773.31	1425.59	1490.94	1457.28	585.34	683.28
4.	United Electrical Industries Limited	39.50	42.26	48.68	70.85	79.86	99.28	116.52	19.37	17.15
5.	The Metropolitan Engineering Company Limited	19.55	24.57	---	---	22.07	27.85	24.08	44.00	44.00
	Total	403.95	1604.22	1696.85	2026.09	1840.67	1910.50	1872.63	728.63	877.38

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 6.1

Ready Reckoner Table for

Determining Minimum Stock Level in UEI

L-av in month	L-max in month	Minimum Stock level (S-min) in month of average consumption C-av Class of items C-max as percentage of C-av 110% A	125% B	150% C
(1)	(2)	(3)	(4)	(5)
3	4	2	2	3
3	5	3	4	5
3	6	4	5	6
6	8	3	4	6
6	10	5	8	9
6	12	8	9	12
9	12	4	6	9
9	15	8	10	15
9	18	12	15	18
12	15	6	8	10
12	18	8	10	15
12	21	12	15	20
12	24	15	18	24

Source: Stock Consumption File, UEI.

Appendix 6.2

Ready Reckoner Table for Fixing Maximum Stock Level in UEI

L-av in month	L-max in month	Maximum Stock level (S-max) in month of average consumption C-av		
		Class of items C-max as percentage of C-av		
		110% A	125% B	150% C
(1)	(2)	(3)	(4)	(5)
3	4	6	6	7
3	5	7	8	9
3	6	8	9	10
6	8	10	11	13
6	10	12	15	16
6	12	15	16	17
9	12	14	16	19
9	15	18	20	25
9	18	22	25	28
12	15	19	21	23
12	18	21	23	28
12	21	25	28	33
12	24	28	31	37

Source: Stock Consumption File, UEI.

Appendix 6.3

Ready Reckoner Table for Fixing Mean Level in UEI

L-av in month	L-max in month	Control Stock level (S-con) in month of average consumption C-av		
		Class of items C-max as percentage of C-av		
		110% A	125% B	150% C
(1)	(2)	(3)	(4)	(5)
3	4	4	4	5
3	5	5	6	7
3	6	6	7	8
6	8	7	8	10
6	10	9	12	12
6	12	12	13	16
9	12	9	11	14
9	15	13	15	20
9	18	17	20	23
12	15	13	15	17
12	18	15	17	22
12	21	18	22	27
12	24	22	25	31

Source: Stock Consumption File, UEI.

From Appendixes: 6.1, 6.2 and 6.3

L-av - Normal lead time in month

L-max - Maximum lead time

C-av - Average rate of consumption per month

C-max - Maximum rate of consumption per month

Qa - Quantity per phased supply in terms of months at average consumption

S-min - Minimum stock level

S-max - Maximum stock level

B - Extra quantity to be provided for special indent is two months for yearly supply, one month for monthly, quarterly and half yearly supply.

S-min - (C-max x L-max) - (C-av x L-av)

S-max - S-min + Qa + B

$$\text{S-con} - \frac{(\text{S-max} + \text{S-min})}{2}$$

Appendix 6.4

Table for Determining

Maximum and Minimum Control Levels in UEI

Stock levels in terms of month at average consumption		
S-min	S-av	S-max
(1)	(2)	(3)
	Monthly Supplies	
2	3	4
3	4	5
4	5	6
5	6	7
	Quarterly Supplies	
2	4	6
3	5	7
4	6	8
5	7	9
6	8	10
7	9	11
	Half-Yearly Supplies	
2	6	9
3	7	10
4	8	11
5	9	12
6	10	13
7	11	14
	Yearly Supplies	
3	10	17
4	11	18
5	12	19
6	13	20
7	14	21
8	15	22
9	16	23
10	17	24

Source: Stock Consumption File, UEI.

Appendix 6.5

Table Showing Control Procedure Adopted

for Different Items in UEI

Sl. No.	Control Procedure	Inventory Class A	B	C
(1)	(2)	(3)	(4)	(5)
1.	Review of stocks and quantities on order at the time of annual intending and initiate, procurement or disposal action	#	#	#
2.	Initiate emergency procurement when stock in hand reaches the minimum level	#	#	#
3.	Review of next phased supply when stock in hand reached the mean level	Ø	#	Ø
4.	Quarterly review of stock in hand and purchase order (and indent) outstanding in relation to the requirement and initiate any special action necessary	Ø	Ø	Ø
5.	When stock exceeds the maximum level investigate and initiate suitable action viz., a) to modify or defer future supply b) to dispose of surplus stock	Ø	#	#

Note: # Procedure applicable
Ø Procedure not applicable.

Source: Stock Consumption File, UEI.

Appendix 7.1

"Opening Stock" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	196.07	248.17	206.66	235.45	247.41	270.62	294.45	368.64	505.79
2.	Traco Cable Company Limited	144.88	177.20	133.17	114.18	---	164.64	430.17	1382.92	175.73
3.	Transformers and Electricals Kerala Limited	---	112.13	1063.47	858.73	1205.70	895.28	603.56	1446.99	1303.90
4.	United Electrical Industries Limited	86.12	102.15	106.16	90.88	31.45	98.50	97.31	88.76	98.66
5.	The Metropolitan Engineering Company Limited	67.31	64.41	31.09	---	---	13.05	6.69	3.39	14.51

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 7.2

"Closing Stock" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	270.05	200.16	235.45	247.41	270.62	294.45	368.64	505.79	567.37
2.	Traco Cable Company Limited	177.20	133.17	114.18	---	164.64	440.09	1382.92	175.73	229.46
3.	Transformers and Electricals Kerala Limited	---	1062.97	852.73	1205.70	895.28	603.56	1446.99	1303.90	1682.29
4.	United Electrical Industries Limited	102.15	106.16	90.88	31.45	129.95	97.31	88.74	98.66	102.93
5.	The Metropolitan Engineering Company Limited	64.41	41.80	---	---	13.05	6.69	8.25	14.51	29.10

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 7.3

"Average Stock" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	233.06	224.16	221.05	241.43	259.01	282.53	331.54	437.21	536.58
2.	Traco Cable Company Limited	161.04	155.18	123.67	57.09	83.32	302.36	906.54	779.32	202.56
3.	Transformers and Electricals Kerala Limited	---	587.55	958.10	1032.21	1050.49	749.42	1025.25	1375.44	1493.09
4.	United Electrical Industries Limited	94.13	104.15	98.52	61.16	80.70	97.90	93.02	93.71	100.79
5.	The Metropolitan Engineering Company Limited	65.86	53.10	15.59	---	6.52	9.87	7.47	8.95	21.80

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Appendix 7.4

"Gross Margin" of Various Public Sector Electrical Undertakings in Kerala from 1981-82 to 1989-90

(Rs. in lakhs)

Sl. No.	Name of the Undertaking	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	68.74	58.46	-10.06	24.41	-126.84	7.45	-51.99	-40.47	93.31
2.	Traco Cable Company Limited	43.46	56.28	-21.48	---	-19.11	-17.02	-52.48	22.51	15.78
3.	Transformers and Electricals Kerala Limited	---	-448.75	-69.54	-639.25	-921.31	-733.36	-745.37	-961.51	-555.22
4.	United Electrical Industries Limited	23.64	-20.12	-63.53	-87.92	-54.68	-87.11	-88.78	-93.44	29.03
5.	The Metropolitan Engineering Company Limited	5.99	-39.90	---	---	-22.73	-29.86	-33.76	-32.52	-36.11

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1981-82 to 1989-90).

Table 3.4

Power Generation Trends

(Billion KWH)

Year	Hydel	Thermal	Total
1984-85	53.90	102.90	156.80
1985-86	51.00	119.30	170.30
1986-87	53.90	133.90	187.80
1987-88	47.40	154.50	201.90
1988-89	57.70	163.20	220.90

Source: Kothari's Year Book, 1991: p.A-103.

Lightings

The lamp industry produces the whole range of lighting products. Apart from the traditional GLS (General Light Service) lamps or bulbs, the other products in this range are fluorescent tubes, mercury sodium vapour and quartz tungsten halogen lamps. Special purpose lamps include projection, photographic, aviation, locohead and spotlighting lamps. Lamps are also made for printing industry, for surgical application, communication industry and even for therapeutic purposes. In fact in 1988-89, the Government designated the manufacture of decorative lamps as a new industry.

Energy efficiency of electric lamps is of considerable national importance because as much as 17 per cent of power consumption in the country is in the lighting sector.[7]

In view of this fact, the Industry Ministry has identified the lamp industry for special attention with regard to growth and modernization.

In lamp industry, the production of fluorescent tube lamps shows an upward trend compared to that of GLS Lamps. The production of GLS Lamps during 1984-85 was 277 million and it decreased to 250 million during 1988-89, i.e., 9.70 per cent decrease. But the production of fluorescent tube lamps during 1984-85 was 40.40 million and it increased to 50 million, i.e., 23.70 per cent increase (Table 3.5).

Table 3.5

Production Trends in the Lamp Industry

Year	GLS Lamps		Fluorescent Tube Lamps	
	Installed	Annual Production	Installed	Annual Production
1984-85	328	277	46.20	40.40
1985-86	343	269	41.90	40.70
1986-87	343	284	41.90	47.00
1987-88	343	256	46.20	45.70
1988-89	343	250	46.20	50.00

Source: Kothari's Year Book, 1991, p.A-102.

The production target of the Electric Power Equipments and most of the Electrical Components and Consumer Durables during 1989-90 was much higher than that of the actual production during 1984-85 (Table 3.6).

Table 3.6

Production Target for Selected Electrical Goods

Item	Unit	1984-85 (Actual)			1989-90 (Target)		
		Capacity	Production	Capacity Utilisation per cent	Capacity	Production	Capacity Utilisation per cent
Electric Power Equipment							
Steam turbines	MKW	4.50	2.90	64.40	4.50	3.70	82.20
Hydro turbines	MKW	1.30	1.30	100.00	1.70	1.40	82.40
Transformers	MKVA	39.40	25.40	64.50	40.00	32.00	80.00
Electric motors	MHP	7.90	4.90	62.00	8.50	6.50	76.50
Electric Components and Consumer Durables							
ACSR & AA conductors	'000 tonnes	150.00	53.00	35.30	150.00	50.00	33.30
PVC & VIR Cables Mill (Org. Sector)	Mill Metres	1310.00	534.00	40.80	1330.00	700.00	52.60
Dry cells	Milnos	1624.00	1148.00	70.70	1800.00	1400.00	77.80
Storage batteries	Milnos	2.90	2.00	69.00	4.00	2.80	70.00
HT insulators	'000 tonnes	45.00	32.00	71.10	60.00	45.00	75.00
Domestic refrigerators	'000 nos.	550.00	572.00	104.00	1000.00	900.00	90.00
Welding electrodes	MRM	800.00	690.00	86.30	1200.00	1000.00	83.30
Electric fans	Milnos	4.08	4.80	117.60	7.00	6.50	92.50

Source: Kothari's Year Book, 1991: p.A-102.

Table 3.7 shows the list of various electrical industrial units in India, both in the private and public sector, and their year of incorporation, registered office and authorised capital.

Table 3.7

List of Various Electrical Industrial Units in India

Sl. No.	Name of the Company	Year of Incorporation	Registered Office	Authorised Capital (Amount in Rs.)
	Batteries			
1.	Chloride Industries Ltd.	1947	Exide House, Calcutta	25,00,00,000.00
2.	High Energy Batteries (India) Ltd.	1961	Orini House, Perungudi Madras	2,00,00,000.00
3.	Nicco Batteries Ltd.	1984	Ghaziabad, Uttar Pradesh	4,60,00,000.00
4.	Standard Batteries Ltd.	1945	Santa Cruz, East Bombay	5,00,00,000.00
5.	UB-MEC Batteries Ltd.	1946	Yeswanthpur, Bangalore	1,22,50,000.00
6.	Willard India Ltd.	1973	Bulandshah, Uttar Pradesh	5,00,00,000.00
	Cables and Wires			
7.	Asian Cables Corporation Ltd.	1959	Dorli, Bombay	5,00,00,000.00
8.	Cable Corporation of India Ltd.	1957	Dorli, Bombay	15,00,00,000.00
9.	Deepak Insulated Cable Corporation Ltd.	1963	Bangalore, Tumkur Road, Naganandra	2,00,00,000.00
10.	Delton Cables Ltd.	1964	Daryaganj, New Delhi	3,00,00,000.00
11.	Devidayal Electronics Wires Ltd.	1953	Gupta Mills, East Bombay	1,50,00,000.00
12.	Finolex Cables Ltd.	1967	Pimpri, Pune	10,00,00,000.00
13.	Gangappa Industries Ltd.	1965	Uppal Road, Hyderabad	2,20,00,000.00
14.	Hindustan Transmission Products Ltd.	1934	Vihar Road, Bombay	10,00,00,000.00
15.	Incab Industries Ltd.	1920	Hare Street, Calcutta	10,00,00,000.00

16.	Industrial Cables India Ltd.	1955	Patiala, Punjab	4,50,00,000.00
17.	Jay Electric Wire Corporation Ltd.	1974	New Marine Lines, Bombay	---
18.	Karnataka Tele Cables Ltd.	1982	Balavadi, Mysore	5,00,00,000.00
19.	(The) National Insulated Cable Company of India Ltd.	1942	Hare Street, Calcutta	2,90,00,000.00
20.	Premier Cable Company Ltd.	1962	M.G. Road, Ernakulam, Kerala	2,50,00,000.00
21.	Sterlite Industries (India) Ltd.	1975	Nariman Point, Bombay	5,00,00,000.0C
22.	Telelink Nicco Ltd.	1983	Hare Street, Calcutta	8,00,00,000.0C
23.	Universal Cables Ltd.	1945	Satna, Madhya Pradesh	20,00,00,000.0(
24.	Upcom Cables Ltd.	1984	Lucknow, Uttar Pradesh	1,20,00,00,000.0(
25.	Usha Beltron Ltd.	1986	Ranchi, Bihar	10,00,00,000.0(
26.	Victor Cables Ltd.	1980	Faridabad, Haryana	2,50,00,000.0(
27.	Vindhya Telelinks Ltd.	1983	Rewa, Madhya Pradesh	5,00,00,000.0(
28.	Wandleside National Conductors Ltd.	1960	Ballard Estate, Bombay	50,00,000.0(
29.	Traco Cable Company Ltd.	1960	Panampilli Nagar, Cochin	8,00,00,000.0(
	Dry Cells			
30.	Geep Industrial Syndicate Ltd.	1948	South Road, Allahabad	1,50,00,000.0
31.	Indo National Ltd.	1972	Mount Road, Madras	1,25,00,000.0
32.	Lakhanpal National Ltd.	1972	Baroda, Gujarat	5,00,00,000.0
33.	Punjab Anand Batteries Ltd.	1972	Ropar, Punjab	1,50,00,000.0
34.	Toshiba Anand Batteries Ltd.	1971	M.G. Road, Ernakulam, Kerala	2,00,00,000.0
35.	United Carbide India Ltd.	1934	Middleton Street, Calcutta	40,00,00,000.0
	Fans			
36.	(The) Jay Engineering Works Ltd.	1935	Kasturba Gandhi Marg, New Delhi	5,00,00,000.0
37.	Goa Electricals and Fans Ltd.	1985	Ponda, Goa	1,50,00,000.0
38.	Kedia Electricals Ltd.	1970	Bala Nagar, Hyderabad	1,50,00,000.0
39.	Khaitan Electricals Ltd.	1981	J.L. Nehru Road, Calcutta	5,00,00,000.0
40.	Khaitan Fans (India) Ltd.	1984	J.L. Nehru Road, Calcutta	2,00,00,000.0

41.	Khaitan Tibrewala Electricals Ltd.	1975	Bala Nagar, Hyderabad	5,00,00,000.00
42.	Polar Electricals Ltd.	1982	Civil Lines, Delhi	1,50,00,000.00
43.	Polar Fan Industries Ltd.	1978	Brahmo Samaj Road, Calcutta	3,00,00,000.00
44.	Polar Industries Ltd.	1982	Park Street, Calcutta	3,50,00,000.00
45.	Ravi Air-cools Ltd.	1974	Varanasi, Uttar Pradesh	1,25,00,000.00
46.	Sam Electro Mechanical Industries Ltd.	1983	Udyog Nagar, Kanpur	1,00,00,000.00
	Lightings			
47.	Ajay Electrical Industries Ltd.	1971	A-l Karam, Para, New Delhi	2,00,00,000.00
48.	Genelec Ltd.	1957	Ballard Estate, Bombay	2,50,00,000.00
49.	Hyderabad Lamps Ltd.	1981	Park Lane Secunderabad, Andhra Pradesh	3,00,00,000.00
50.	Lumax Industries Ltd.	1981	Gokhale Market, Delhi	3,00,00,000.00
51.	(The) Mysore Lamp Works Ltd.	1936	Malleswaram West, Bangalore	2,00,00,000.00
52.	Punjab Anand Lamp Industries Ltd.	1983	Ropar District, Punjab	12,00,00,000.00
53.	Sylvania and Laxman Ltd.	1962	Najafgarh Road, New Delhi	5,00,00,000.00
54.	Webfil Ltd.	1979	Rajendra Prasad Sarani, Calcutta	3,00,00,000.00
	Motors			
55.	Asea Brown Baveri Ltd.	1949	Dr. Annie Besant Road, Bombay	25,00,00,000.00
56.	Best and Crompton Engineering Ltd.	1911	Anna Salai, Madras	10,00,00,000.00
57.	Bharat Bijlee Ltd.	1946	Prabhadevi, Bombay	2,00,00,000.00
58.	Crompton Greaves Ltd.	1937	Gandhi Marg, Bombay	20,00,00,000.00
59.	DLF Universal Ltd.	1963	Faridabad, Haryana	5,00,00,000.00
60.	General Electric Company of India Ltd.		Chittaranjan Avenue, Calcutta	30,00,00,000.00
61.	Jyoti Electric Motors Ltd.	1966	Kheda District, Gujarat	50,00,000.00
62.	Kirloskar Electric Company Ltd.	1946	Rajaji Nagar, Bangalore	20,00,00,000.00
63.	Sahney Paris-Rhone Ltd.	1973	27 Kirol, Bombay	1,00,00,000.00
64.	Siemens Ltd.	1957	Worli, Bombay	25,00,00,000.00

	Power			
65.	(The) Ahmedabad Electricity Co. Ltd.	1913	Ahmedabad, Gujarat	30,00,00,000.00
66.	(The) Andhra Valley Power Supply Co. Ltd.	1916	Homi Mode Street, Bombay	16,20,00,000.00
67.	Anand Electric Supply Co. Ltd.	1936	Fort, Bombay	5,00,00,000.00
68.	Bombay Suburban Electric Supply Co. Ltd.	1929	Veer Nariman Road, Bombay	1,00,00,00,000.00
69.	GESL Ltd.	1978	Chowringhee-sgnore, Calcutta	26,50,00,000.00
70.	Dishergarth Power Supply Co. Ltd.	1919	Rajendra Prasad Sarani, Calcutta	1,24,00,000.00
71.	(The) Sarat Electricity Co. Ltd.	1920	Station Road, Surat	2,00,00,000.00
72.	(The) Tata Hydra-Electric Power Supply Co. Ltd.	1910	24, Homi Mody Street, Bombay	10,80,00,000.00
73.	Thana Electric Supply Co. Ltd.	1928	Ballard Estate, Bombay	2,00,00,000.00
74.	(The) Tata Power Co. Ltd.	1919	24, Homi Mody Street, Bombay	27,00,00,000.00
	Others			
75.	(The) Aluminium Industries Ltd.	1946	Kundara, Kerala	12,50,00,000.00
76.	Andhra Mechanical and Electrical Industries Ltd.	1967	Secunderabad, Andhra Pradesh	1,00,00,000.00
77.	Bajaj Electricals Ltd.	1938	Veer Nariman Road, Bombay	2,00,00,000.00
78.	Baroda Electric Metres Ltd.	1961	Kheda District, Gujarat	1,00,00,000.00
79.	ECE Industries Ltd.	1945	Kasturba Gandhi Marg, New Delhi	15,00,00,000.00
80.	Eastern Circuits Ltd.	1984	Area Colony, Bhopal	3,00,00,000.00
81.	EMA India Ltd.	1971	Udyoga Nagar, Kanpur	2,00,00,000.00
82.	Easun Reyrolla Relays and Devices Ltd.	1974	Alwarpet, Madras	1,00,00,000.00
83.	Eddy Current Controls (India) Ltd.	1971	Chalakudy, Kerala	1,00,00,000.00
84.	Electra (India) Ltd.	1971	Meerut, Uttar Pradesh	3,00,00,000.00
85.	Electra (Jaipur) Ltd.	1972	Victoria Park, Meerut	1,00,00,000.00
86.	Electric Control Gear (India) Ltd.	1978	Rakhial Road, Ahemedabad	1,00,00,000.00
87.	Electrical Manufacturing Company Ltd.	1953	136, Jessore Road, Calcutta	2,00,00,000.00
88.	Elpro International Ltd.	1962	Ballard Estate, Bombay	2,00,00,000.00
89.	Emco Transformers Ltd.	1964	Nariman Point, Bombay	75,00,000.00

90.	(The) English Electric Company of India Ltd.	1957	Netaji Subhas Road, Calcutta	10,00,00,000.00
91.	Hind Rectifiers Ltd.	1958	Lake Road, Bhanday Bombay	1,00,00,000.00
92.	India Meters Ltd.	1963	158, Greams Road, Madras	2,15,00,000.00
93.	Jyothi Ltd.	1943	Industrial Area, Nadodara	6,00,00,000.00
94.	Jyothi Structures Ltd.	1974	Bandra East, Bombay	2,00,00,000.00
95.	KLK Electrical Industries Ltd.	1980	Ambathur Industrial Estate, Madras	2,00,00,000.00
96.	Khatau Jumber Ltd.	1964	Mahim, Bombay	1,00,00,000.00
97.	Kirloskar Systems Ltd.	1962	Bangalore	1,00,00,000.00
98.	Lakshmi Electrical Control Systems Ltd.	1981	Avanashi Road, Coimbatore	5,20,00,000.00
99.	Modern Insulators Ltd.	1982	Moti Dungari Road, Jaipur	9,00,00,000.00
100.	Nicco Orissa Ltd.	1979	Mayur Bary, Orissa	8,00,00,000.00
101.	O.E.N. Connectors Ltd.	1981	Vyttilla, Cochin	3,00,00,000.00
102.	Permanent Magnets Ltd.	1960	Raopura, Baroda	1,00,00,000.00
103.	Pansami India Ltd.	1984	Banipan, Jaipur	10,00,00,000.00
104.	SSB Industries Ltd.	1975	Anna Salai, Madras	1,50,00,000.00
105.	SLS Power Switchgear Ltd.	1975	Porur, Madras	2,00,00,000.00
106.	Seshasayee Industries Ltd.	1957	Vadalur South, Arcot	5,00,00,000.00
107.	Shivalik Bimetal Controls Ltd.	1984	Solan District, Himachal Pradesh	1,00,00,000.00
108.	Southern Switch Gear Ltd.	1963	Ambathur Industrial Estate, Madras	1,00,00,000.00
109.	Stone India Ltd.	1931	Taratolla Road, Calcutta	2,50,00,000.00
110.	Transformers and Electricals Kerala Ltd.	1963	Ernakulam District, Kerala	15,00,00,000.00
111.	Tamus Electric Corporation Ltd.	1973	Rewa, Madhya Pradesh	1,00,00,000.00
112.	United Electrical Industries Ltd.	1950	Pallimukku, Quilon, Kerala	3,00,00,000.00
113.	Usha Rectifier Corporation of India Ltd.	1962	5, Parliament Street, New Delhi	3,00,00,00,000.00
114.	Vishal Electra-Mech (India) Ltd.	1986	New Marine Lines, Bombay	1,25,00,000.00
115.	W.S. Industries India Ltd.	1961	St. Thomas Mount, Madras	7,50,00,000.00
116.	Webel Sen Capacitors Ltd.	1981	Bidhan Nagar, Calcutta	1,50,00,000.00
117.	Kerala Electrical and Allied Engineering	1964	Panampilly Nagar, Cochin	15,00,00,000.00
118.	The Metropolitan Engineering Co. Ltd.	1945	West Tampannor, Trivandrum	40,00,000.00

Source: Kothari's Year Book, 1991: 58-66.

Industrial Profile of the State of Kerala

The State of Kerala failed to partake in the general buoyancy of the Indian economy during the first two five year plan periods. The pace of industrialisation of a region or a country depends upon factors such as the availability of local natural resources, development of infrastructure facilities, entrepreneurial skill, attitudes and industrial investment, level of skills etc. Though the State possesses certain basic requirements of industrial growth, it has yet to pick up momentum in the field of industrial development. Compared to many other states of India, Kerala has fairly developed overhead facilities. The agricultural sector is also fairly developed. But the industrial sector continues to be taidy and halting.

With the low rate of growth of the regional economy, there have not been opportunities for the creation of productive employment on a large-scale. Unemployed labour problem erodes living standards. The state produces very few of the goods that it consumes. On the whole, the fragile production base has been constraining the sustenance of the positive achievements and the improvement in the living standard of the people.

The sectorial changes in the economy show a positive shift towards the secondary sector. Though stagnant in terms of its share in the total value added for the most part in the eighties, the secondary sector has shown substantial potential to grow as displayed by its growing share in the total income (Table 3.8). A closer scrutiny of the secondary sector shows that the impetus to growth has come from the industrial sector.

Table 3.8

Sectorial Contribution of Net Domestic Product of Kerala

(in per cent)

Sector	At Current Prices				At Constant Prices		
	1980-81	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Primary	39.17	35.76	32.38	31.34	39.08	36.81	36.55
Secondary	24.33	23.90	25.94	26.64	22.74	25.12	26.56
Territory	36.50	40.34	41.68	42.02	38.18	38.07	36.89
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: 1) Department of Economics and Statistics

2) Central Statistical Organisation.

National Income and State Income (New Series).

The sectorial distribution of the state income at current prices is given in Appendix 3.1 and at constant prices in Appendix 3.2.

The per capita income of the State of Kerala is significantly low when compared to the national average even though the relative gap has narrowed down marginally (Table 3.9). The per capita income is only about three-fourth of the national average.

As per the quick estimates, the state income in 1991-92 at constant prices (1980-81) is likely to go up by 7.13 per cent from Rs.5,104.00 crores in 1990-91. At current prices the income is estimated at Rs.12,808.00 crores in 1991-92 as against Rs.11,499.00 crores in 1990-91 registering a growth rate of 11.38 per cent. The per capita state income at constant prices in 1991-92 estimated at Rs.1,802.00 is higher by 5.63 per cent compared to the per capita income of Rs.1,706.00 estimated for the preceding year. At current prices the per capita income has registered a growth rate of 9.81 per cent from Rs.3,843.00 in 1990-91 to Rs.4,220.00 in 1991-92.

Table 3.9

Estimates of Total and Per Capita Income of Kerala and India

Item	1980-81	1989-90	Growth Rate %	1990-91 (Q)	Growth Rate %	1991-92 (A)	Growth Rate %
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
National Income (Rs. in crores)							
At current prices	1,10,675	3,51,850	14.00	4,16,349	18.33	N.A.	---
At constant prices	1,10,675	1,76,159	6.00	1,86,429	5.83	N.A.	---
State Income (Rs. in crores)							
At current prices	3,829	10,174	11.36	11,499	13.02	12,808	11.38
At constant prices	3,829	4,705	5.88	5,104	8.48	5,468	7.13
Per Capita National Income							
(Rs. in crores)							
At current prices	1,630	4,291	11.60	4,974	15.92	N.A.	---
At constant prices	1,630	2,148	3.80	2,227	3.68	N.A.	---
Per Capita State Income (Rs. in crores)							
At current prices	1,513	3,451	9.69	3,843	11.36	4,220	9.81
At constant prices	1,513	1,596	4.31	1,706	6.89	1,802	5.63

Note: 1) Constant prices refer to 1980-81 as base.

2) P - Provisional, Q - Quick Estimate, A - Anticipated, N.A. - Not Available.

Source: 1) Department of Economics and Statistics

2) Central Statistical Organisation; National Income and State Income (New Series).

The analysis of the recent ASI data (Table 3.10) does not show any significant change in the industrial base. It is also clear that Kerala lacks a balanced industrial base. The relative importance of some traditional industries like petroleum, ship building, electronics etc., has increased over a period of time. Still, major industries in Kerala are of a traditional variety and based on the region's natural resources. Hence it may be argued that the overall industrial base of the state is still characterised by concentration on food industries.[8]

The overall growth achievement of the State of Kerala is relatively poor compared to most of the other States.[9] She has been occupying a very low position, i.e., 14th among the different states in the matter of industrialisation explained in terms of value added (Table 3.11). The share in value added in Kerala is comparatively low and is below the national average. The implication is that agricultural sector alone cannot be expected to provide growth dynamism. An industrial base is needed to stimulate and sustain the growth process. It only can provide the base for diversifying the economic structure and developing forces of production within the region.

Table 4.8

Current Ratio (Ratio of Current Assets to Current Liabilities)

of the Various Public Sector Electrical Undertakings in Kerala from 1980-81 to 1989-90

Sl. No.	Name of the Undertaking	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Kerala Electrical and Allied Engineering Company Limited	2.36	2.85	3.19	3.27	3.58	3.76	4.42	5.16	2.56	2.03
2.	Traco Cable Company Limited	2.67	2.64	3.01	3.48	---	2.83	5.01	2.30	2.33	2.42
3.	Transformers and Electricals Kerala Limited	---	---	1.64	1.35	1.06	1.34	1.02	1.59	0.80	0.92
4.	United Electrical Industries Limited	3.58	4.54	4.00	2.77	1.72	1.80	1.56	1.13	0.55	0.69
5.	The Metropolitan Engineering Company Limited	2.87	3.56	1.92	---	---	1.27	0.75	0.64	0.48	0.50

Source: Government of Kerala, Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1980-81 to 1989-90).

The productivity aspect of inventory management is often overlooked or is not adequately looked after in most of the public sector electrical undertakings in Kerala. This aspect of inventory is positively rewarding in large measure, because inventory is the largest co-partner in the total cost partnership.

Productivity reduces the cost of input and it would be observed how dramatic the results could be through better management.[13]

Let us assume per Rs.200/- worth of annual sales:

Direct material cost	-	Rs.120/-
Average stock (Say eight months)	-	Rs.80/-
Cost of carrying inventories	-	Rs.16/-
Inventory carrying cost (Say 75 per cent)	-	20 per cent

Let us further assume:

Inventories can be reduced by at least	-	20 per cent
Purchase bill can be reduced by at least	-	5 per cent

Results:

Reduction in inventory carrying cost 20 per cent of Rs.16/- (75 per cent being variable thereof)	-	Rs.2.40
Saving through reduction in purchase bill 5 per cent of Rs.120/-	-	Rs.6.00
Total saving	-	Rs.8.40

If an undertaking makes a profit of 10 per cent on sales, the amount of profit is Rs.20/-. Now the profit would be Rs.28.40 which would mean a profit of 14.20 per cent on sales. This increase of 4.20 per cent in profit is equivalent to increasing of sales by 42 per cent.

Conclusion

Great management thinkers have concentrated their observations on labour and attached more importance to the human side of the organisation. The area of materials is usually neglected. However, the business community is realizing the vital role played by materials in any organisation.

It is the control over material costs which makes the organisations stand competitions and help them be top in the world of business. The business community cannot simply forget the area of materials and think of surviving in the market. According to P.F. Drucker[14] materials in a manufacturing business are almost always a cost centre of first magnitude and concentration must center on controlling the costs where they are.

Notes

[1] Government of Kerala, A Review of Public Enterprises in Kerala (Trivandrum: Bureau of Public Enterprises, 1989-90) pp.117-138.

[2] Sandilya, M.S. and Gopalakrishnan, P., Inventory Management: Text and Cases (New Delhi: MacMillan India Limited, 1981) p.42.

[3] Gopal, K., "Inventory Management," Management Accountant, Vol. 29, No. 7, July 1994: p.596.

[4] Government of Kerala, op.cit., pp.117-138.

[5] ibid., pp.117-138.

[6] Suresh, B.H., "Materials: A Potential Area for Improving Profits," Management Accountant, op.cit., p.209.

[7] Chadda, R.S., Inventory Management in India (New Delhi: Allied Publishers Pvt. Ltd., 1968) p.161.

[8] Raj, K. Nigam, "Capacity Utilisation in Key Public Sector Enterprises," Management Accountant, Vol. 23, No. 12, Dec. 1994: p.210.

[9] Pavaskar, C.V., "Industrial Law for Dynamic Growth," Commerce, 23 Feb. 1985: p.353.

[10] Wayenekeller, "The Critical Areas of Material Cost Control," NACA Bulletin, July 15, 1948. Reprinted in Readings in Cost Accounting, Budgeting and Control, Ed. William E. Thomas: p.640.

[11] Sandilya, M.S. and Gopalakrishnan, P., op.cit., p.40.

[12] Annual Consumption Files of KEL, Traco, TELK, UEI and The Metropolitan Engineering Company Limited, 1989-90.

[13] Khawaja Amjad Saccd, "Productivity Increase and Its Sharing," The Management Accountant, Vol. 26, No. 12, Dec. 1991: p.969.

[14] Peter F., Drucker, Management for Results (New Delhi: Allied Publishers, 1977) p.76.

Chapter VI

Tools and Techniques of Inventory Management

The various concepts of inventories like inventory: a major cost component, lead time influences on inventories and productivity of inventories have been discussed in the fifth chapter.

The basic problem of inventory management is to strike a balance between the operating efficiency and the cost of investment and other associated costs with large inventories, with the object of keeping the basic conflicts at the minimum while optimizing the inventory holding.[1] The decisions as to which item to make and when to keep inventories in balance require application of a wide range of techniques from simple graphical methods to more sophisticated and complex quantitative techniques. Many of these techniques employ concepts and tools of mathematics and statistics and make use of various control theories from engineering and other fields. They are primarily aimed at helping to make better decisions and getting people employed and follow a wiser policy.

Inventory Management Techniques

Various techniques applied for inventory management are as follows:

(1) Selective Inventory Control

(2) Setting of Various Stock Levels

(3) Systems of Inventory Control

(4) Economic Ordering Quantity or E.O.Q. Formula

(5) Re-order Point and Safety Stock

(6) Application of Computers for Inventory

(7) Just-in-Time Inventory Management

(8) Inventory Audit.

(1) Selective Inventory Control

Effective inventory management requires understanding and knowledge of the nature of inventories and, to gain this understanding, some analysis and classification of inventory are required.[2] They are:

(a) A.B.C. Analysis

(b) H.M.L. Analysis

(c) X.Y.Z. Analysis

(d) V.E.D. Analysis

(e) F.S.N. Analysis

(f) S.D.E. Analysis

(g) G.O.L.F. Analysis

(h) S.O.S. Analysis.

Table 6.1

Classification of Inventories

Sl. No.	Title	Basis	Main use
1.	A.B.C. (Always Better Control)	Value of consumption	To control raw material components and work-in-progress inventories in the normal course of business
2.	H.M.L. (High, Medium Low)	Unit price of the material	Mainly to control purchases
3.	X.Y.Z.	Value of items in storage	To review the inventories and their uses at scheduled intervals
4.	V.E.D. (Vital, Essential Desirable)	Criticality of the component	To determine the stocking levels of spare parts
5.	F.S.N. (Fast moving, Slow moving, Non-moving)	Consumption pattern of the component	To control obsolescence
6.	S.D.E. (Scarce, Difficult, Easy to obtain)	Problems faced in procurement	Lead time analysis and purchasing strategies
7.	G.O.L.F. (Government, Ordinary, Local, Foreign Sources)	Source of the material	Procurement strategies
8.	S.O.S. (Seasonal, Off-Seasonal)	Nature of supplies	Procurement/holding strategies for seasonal items like agricultural prcducts

Source: Sandilya, M.S. and Gopalakrishnan, P., Inventory Management: Text and Cases (Delhi: MacMillan India Limited, 1981) p.51.

The motive behind the above analyses and classifications is to tackle important aspects more rigorously. Moreover, an equally critical analysis of all items will be very expensive and will have a diffused effect regardless of priorities. Table 6.1 shows the available classifications, their bases and their uses.

A.B.C. Analysis

The method follows the general principles of Pareto (Wilfredo Pareto, Italy, 1896) that "in any series of elements to be controlled, a selected small fraction in terms of numbers of elements would always account for a large fraction in terms of effect."[3] With some practices, the limits of 'A', 'B' and 'C' can be easily determined by a Pareto Analysis; namely 'A' items do not exceed more than 70 per cent of the investment, 'B' items account for only a moderate share, and 'C' items for less than 10 per cent of total investment.

The A.B.C. Analysis is a rational approach for determining the degree of control that should be exercised on each item in inventories. Obviously, 'A' class items should be subjected to strict management control under either continuous review or periodic review with short review cycles. 'C' class items require little attention and can be relegated down the line for periodic review say, just once a year. Control over 'B' class items should be somewhere in-between.

The method of A.B.C. classification for managing inventories has been adopted in the public sector electrical industrial units in Kerala. Inventories of these undertakings are classified into various categories on the basis of their importance, namely their value and frequency of replenishment during a period. One category called group 'A' items, consists of only a small percentage of the total items handled but has a combined value that constitutes a major or large portion of the total stock holding of the concern. The second category consisting of group 'B' items is relatively less important. The third category consisting of 'C' items is of least importance, i.e., the group consists of a very large number of items, the value of which is not very high.

A.B.C. Analysis of UEI

For the purpose of A.B.C. classification of inventories and the method of control to be adopted for each category of items, the company first of all lists out all the items of inventory and values of each item. The value is obtained by multiplying the average annual consumption of an item during a period by its unit cost. The items in the list are then rearranged in the descending order of their values irrespective of their quantities. Thus 200 kg. of an item valued at Rs.2,00,000/- should be ranked earlier than 20,000 kg. of another item, the value of which is Rs.18,000/-. A running total of all the values is then taken. It is found that a large percentage of the total value is covered by the first few items in the list. They are grouped in the 'A' category, the next few items which have the next least value under 'B' group and the last value items are grouped under 'C' category. So, by controlling the 'A' group items only, a better inventory control is possible. Table 6.2 shows the classification of inventories and its annual consumption value of the United Electrical Industries Limited.

An analysis of the annual consumption of the UEI shows that 80 per cent of the total number of items are under category 'A'. Similarly five per cent of the total annual consumption value accounts for more than 70 per cent of the total number of items under category 'C' and 15 per cent of the total annual consumption value accounts for nearly 20 per cent of the total number of items under category 'B'. Table 6.3 shows the above characteristics.

Table 6.2

Classification of Inventories

and its Annual Consumption Value

of United Electrical Industries Limited

Sl. No.	Name of Item	Annual Consumption Value
	A Group	
1.	Magnet	74,00,000
2.	41 S.N.G.	55,00,000
3.	Lamination	41,00,000
4.	Brass Terminals	22,00,000
5.	Magnet Yoke	10,00,000
	B Group	
1.	Copper Strips	73,000
2.	M.S. Screws Hl	72,000
3.	Sealing Led	71,000
4.	Press-Phan Sheet	70,000
5.	Charcoal	68,000
	C Group	
1.	Grinding Wheel	14,000
2.	Leather Glouse	14,000
3.	Screw Drivers	13,000
4.	Insulation Tape	12,000
5.	Acid	11,000

Source: Annual Consumption File, U.E.I.

Table 6.3

A.B.C. Analysis of United Electrical Industries Limited

Class	Number of Item (% of total)	Value of Item (% of total)
A	10	80
B	20	15
C	70	5

Source: Annual Consumption File, U.E.I.

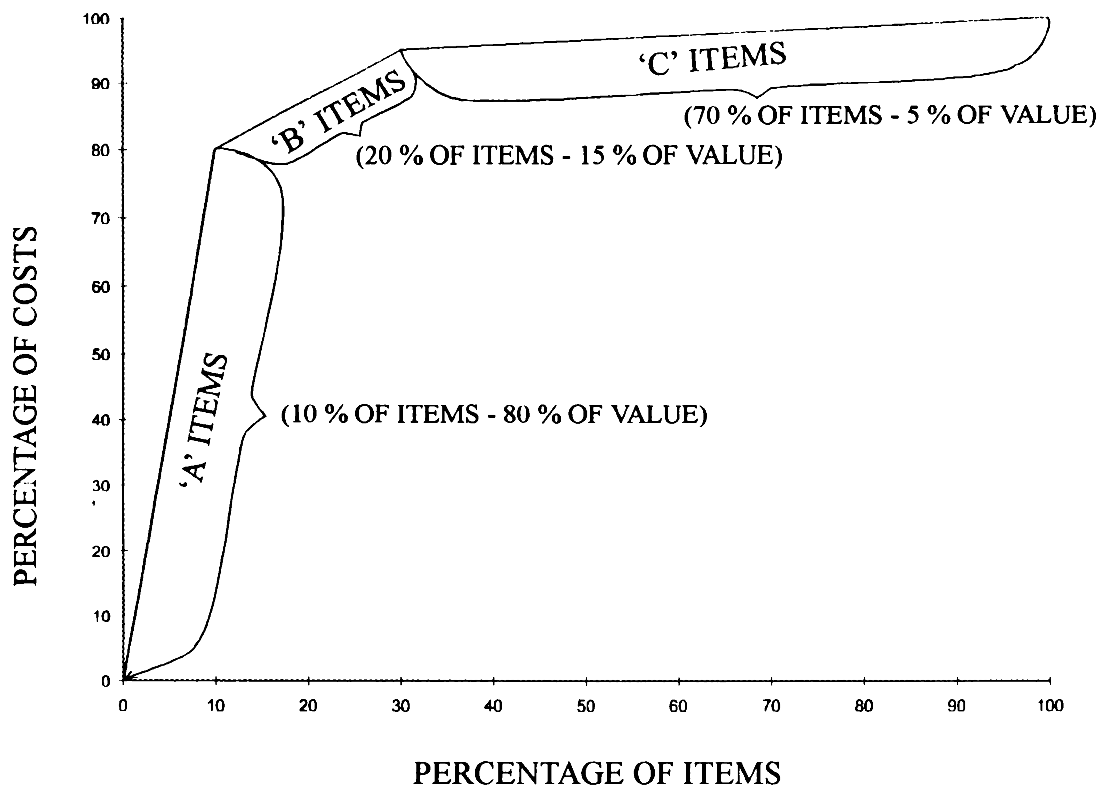
Table 6.3 is depicted graphically in Figure 6.1.

(2) **Setting of Various Stock Levels**

The various stock levels fixed for effective management of inventories are maximum level, minimum level, ordering or reordering level and danger level. These levels serve as indices for initiating action on time so that the quantity of each item of material, i.e., the inventory holding is controlled.

Stock levels are not fixed on a permanent basis but are liable to revision in accordance with the changes in the factors determining the levels.

Figure 6.1
A B C Analysis in U.E.I



The formulae used for fixing various levels are:

Maximum Level

= Re-order level − Expected minimum consumption in units during minimum weeks to obtain delivery + Re-order quantity

Minimum Level

= Re-order level − (Average usage per period x Average time to obtain delivery)

Re-order Level

= Maximum re-order period x Maximum usage

Average Stock Level

$$= \frac{\text{Maximum level} + \text{Minimum level}}{2}$$

Danger level is fixed usually below the minimum level. When the stock reaches this level, very urgent action for purchase is indicated. This presupposes that the minimum level contains a cushion to cover such contingencies.

Procedure of Determining Stock Levels in UEI

In UEI the stock control is made on the basis of three levels such as:

(a) Minimum level

(b) Maximum level

(c) Mean level.

A safety stock (minimum stock) is maintained for each stock item to provide a cushion for the following emergencies:

(i) Supplies being delayed beyond normal lead time.

(ii) Consumption rate exceeding estimated average rate.

(a) **Minimum Level**

A formula which is used by the company for fixing minimum level is:

Smin = (Cmax x Lmax) - (Cav x Lav)

Where

Smin = Minimum stock

Cmax = Maximum rate of consumption per month

Lmax = Average rate of consumption per month

Cav = Maximum lead time in month or maximum period between two consecutive phased supplies

Lav = Average lead time.

(b) **Maximum Level**

Maximum stock is the minimum stock plus the phased supply quantity plus one or two months consumption (to allow for receipt of the phased supply arriving ahead of the expected time or before the stock reaches the minimum level).

If the actual stock of any item exceeds the maximum level then the next phased supply is deferred or revoked as found necessary.

Formula used for fixing maximum level is

Smin = (Cmax x Lmax) + Qa + B

Where

Smin = Minimum stock

Cmax = Maximum consumption per month

Lmax = Maximum lead time

Qa = Quantity receivable for phased supply against annual indent.

B = Extra quantity to be provided for special indent.

(c) **Mean Level**

Mean level is the average of maximum and minimum stock levels. In UEI in the case of 'B' items a review of the next phased supply is made when stocks in hand touch this mean level and necessary action is taken as follows:

(i) If the stocks are not adequate to meet the requirements till the expected time of receiving the next phased supply, the next phased supply will be advanced or extra quantity will be procured by special indent.

16.	Industrial Cables India Ltd.	1955	Patiala, Punjab	4,50,00,000.00
17.	Jay Electric Wire Corporation Ltd.	1974	New Marine Lines, Bombay	---
18.	Karnataka Tele Cables Ltd.	1982	Balavadi, Mysore	5,00,00,000.00
19.	(The) National Insulated Cable Company of India Ltd.	1942	Hare Street, Calcutta	2,90,00,000.00
20.	Premier Cable Company Ltd.	1962	M.G. Road, Ernakulam, Kerala	2,50,00,000.00
21.	Sterlite Industries (India) Ltd.	1975	Nariman Point, Bombay	5,00,00,000.00
22.	Telelink Nicco Ltd.	1983	Hare Street, Calcutta	8,00,00,000.00
23.	Universal Cables Ltd.	1945	Satna, Madhya Pradesh	20,00,00,000.00
24.	Upcom Cables Ltd.	1984	Lucknow, Uttar Pradesh	1,20,00,00,000.00
25.	Usha Beltron Ltd.	1986	Ranchi, Bihar	10,00,00,000.00
26.	Victor Cables Ltd.	1980	Faridabad, Haryana	2,50,00,000.00
27.	Vindhya Telelinks Ltd.	1983	Rewa, Madhya Pradesh	5,00,00,000.00
28.	Wandleside National Conductors Ltd.	1960	Ballard Estate, Bombay	50,00,000.00
29.	Traco Cable Company Ltd.	1960	Panampilli Nagar, Cochin	8,00,00,000.00
	Dry Cells			
30.	Geep Industrial Syndicate Ltd.	1948	South Road, Allahabad	1,50,00,000.00
31.	Indo National Ltd.	1972	Mount Road, Madras	1,25,00,000.00
32.	Lakhanpal National Ltd.	1972	Baroda, Gujarat	5,00,00,000.00
33.	Punjab Anand Batteries Ltd.	1972	Ropar, Punjab	1,50,00,000.00
34.	Toshiba Anand Batteries Ltd.	1971	M.G. Road, Ernakulam, Kerala	2,00,00,000.00
35.	United Carbide India Ltd.	1934	Middleton Street, Calcutta	40,00,00,000.0
	Fans			
36.	(The) Jay Engineering Works Ltd.	1935	Kasturba Gandhi Marg, New Delhi	5,00,00,000.0
37.	Goa Electricals and Fans Ltd.	1985	Ponda, Goa	1,50,00,000.0
38.	Kedia Electricals Ltd.	1970	Bala Nagar, Hyderabad	1,50,00,000.0
39.	Khaitan Electricals Ltd.	1981	J.L. Nehru Road, Calcutta	5,00,00,000.0
40.	Khaitan Fans (India) Ltd.	1984	J.L. Nehru Road, Calcutta	2,00,00,000.0

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