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CHAPTER - I

1.1. INTRODUCTION

Economic Development has become the magic word for all the countries of the world to overcome the age old problems in Agriculture, Industry, Trade, Transport etc., Present age is branded as Development Age to propagate faster economic development through rapid industrialization for the process of economic growth. India has been no exception to this universal urge. The strategy of growth pursued in our Five Year Plans aimed at building the Indian economy in a self reliant and self sustained manner. Indian industrial sector witnessed a phenomenal expansion and it has started acquiring commanding heights of the economy because of the policy environment created by the Government for the industrial growth. Further the Liberalization, Privatization and Globalization allowed the foreign capital inflow with quality and competence. Thus, the new economy of India is hit on one hand with the old industries and on the other the new industries. The policies adopted by the old industries in India to cope with the change have been a real acid test of survival. All types of industries have undergone this acid test and cement Industry too has under gone the same and taken it not as challenge but for very survival.

The objectives of a firm can be realized only with the overall effectiveness in all areas of operation which includes the management of materials. Materials management is concerned with input process of manufacturing and includes the flow of raw materials, piece parts, components and finished goods, to supply the sales and marketing functions with product. The ‘input’ process is separated from the ‘output’ process because in a manufacturing concern the functions involved in the input process finally change the physical state of the product. The important aspects of the material management system are ‘materials’, time, and space, and the operation of the system aims to overcome the problems of ‘supply’, distance
and time, in order to obtain product for the minimum cost under the constraint of an established customer service level requirement. The procurement of materials to produce the product is not the sole purpose of manufacturing. The material management concept thus includes elements of procurement, movement, sales and profit with all the changes in society and policy.

Materials Management has been branded as the **kingpin of production**. The task of materials management is integrating external suppliers with internal departments in order to provide a smooth product flow process. Such a task is extremely difficult because of the existence of fundamental conflicts:

- Every supplier aims to maximize his profit
- There may be no overall control of materials within the company because each department wishes to have security of supply without responsibility for either quality or cost.
- There may be no accountability for materials at department level and Costs may not be broken down to product level.
- The poor communication gap between the departments within the company resulting in confusion between the departments.
- Due to the communication gap between the departments the purchase department is given too short notice of time which finally results in poor working relationships with suppliers and the business firm.

Hence, it is necessary to avoid the conflicts and confusion which normally prevails between the internal departments of the firm and the suppliers. This will help the firm to avoid a sub optimal type of functioning and to attain the stage of effective functioning.

The modern business firms face a **large number of pressures** and some of the noted one's are:
• Inflation, which reflects in constant increasing materials and service costs.
• The threat of shortages due to finite resources
• The potential to source materials on international market combined with the fluctuations with currency rates and also financially justifying the transportation costs.
• Rapid improvement in the technology in the international scenario affects the firms locally and hence they face the pressure of updating technology.
• The constant need for the correct delivery without any hindrance.
• The introduction of the high quality standards of Government policies through value analysis.
• The need to maintain a comparative advantage through delivery, reliability and customer service.

Thus, the significance of material management is paramount in these testing times for all the business firms irrespective of either the size or type of the firm. Every firm should adopt a very cautious and awakened frame of material management policy and approach and Cement industry is no exception to the philosophy of materials management. Since the present research study relates to materials management in cement industry, it is felt necessary to present the conceptual and functional frame work of materials management. The following discussion provides the same.

1.2. MANAGEMENT IN RELATION TO MATERIALS FUNCTION:
A detailed discussion on how the basic functions of management can be applied to materials function can be found in A.K. Datta and K.S. Menon. Management is a process involving the responsibility for guiding and supervising the work of others. Management is concerned with managing human beings, money,
machines and materials is a given time frame. The above factors are popularly known as factors of production or the M’s of production. These are the inputs for any production system. The management process is popularly abbreviated as POSDCORB which means planning, organizing, staffing, directing, coordination and control and budgeting. As a result of management process, the inputs are converted into outputs in the form of goods and services.

Table .1.1 indicates the production system as an input-output model.

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<thead>
<tr>
<th>Inputs (Resources)</th>
<th>Management process</th>
<th>Outputs</th>
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<tbody>
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<td>T Men</td>
<td>Planning</td>
<td>Goods</td>
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<tr>
<td>I Money</td>
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<td>M Machines</td>
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<td>E Materials</td>
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<td></td>
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Of the various factors of production, materials are the most important one as they tie up 50 to 60 per cent of the cost of product for successfully increasing the productivity of the industry. Any reduction in the cost of materials results in
increased profits. Thus, materials purchasing should not be regarded as spending activity but converting the industry into a profit centre when an economic purchase and storage of material is done.

In modern industrial management, the materials department is a full-fledged department and not under production department. Materials department is the ‘custodian’ of materials and production department is the ‘user’ department. Under the integrated concept of materials management, both purchasing and storage are integrated under one vice-president responsible for the overall materials function.

1.3. FUNCTIONS OF MANAGEMENT AS APPLIED TO MATERIALS:
The application of POSDCORB to materials function is briefly discussed here.

Planning:
Planning for materials is of utmost importance. Planning decides which materials are needed, when they are needed, and in how much quantity. The well-known tools for materials planning are: (1) Forecasting techniques—Forecasting involves making an educated guess of future demands based on past consumption. This technique is well suited for estimating the requirement of raw material of a particular type. (2) Material requirement planning (MRP)—MRP is a tool for estimating the material requirements of components of different types which produce final assembly of finished equipment. When the demand for finished product is known through forecasting, the demand for sub-assemblies and components that go into the making of the sub-assemblies can be calculated with accuracy by the MRP approach.

Organizing:
Organizing involves developing a hierarchical structure which describes the various positions of personnel and their reporting relationship in terms of responsibility, authority and accountability. Organizing is indicated on an
organization chart which, in the classical situation, forms a pyramidal structure. A good organization structure is essential, so that no confusion remains in the minds of managers with respect to their roles and responsibilities. There is a clear flow of information from top to bottom and vice versa.

**Staffing:**

Staffing function consists of recruiting and retaining of suitable individuals in various positions in the unit. To do this, management assesses future needs and makes necessary arrangements to meet them. Although this is the personnel department’s direct responsibility, the materials manager is also indirectly involved so far as the people under his supervision and control are concerned.

**Directing:**

Directing signifies communication from top to bottom. In case of materials management, the materials manager receives instructions from top management about his broad objective, which usually fall under the following categories.

- Low Price of materials
- High inventory turnover ratio
- Continuous supply of material
- Systematic record keeping
- To minimize the cost of procurement plus storage of material
- Good supplier relations
- Development of personnel in the materials department

**Controlling:**

A materials manager occupies the central position in the sense that, he is linked with suppliers, sales persons, production department, design and development department, apart from his direct link with the top management.
The materials manager has link with finance in respect of procurement of capital goods and equipment, make or buy decisions through break even analysis. His link with production is direct because he has to supply materials needed in assembling and production departments. His link with marketing and sales department is due to his role in material handling and traffic which is responsible for delivering the finished goods to the ultimate customer.

Hence the materials manager is one who is in contact with all the functional areas of the organization. He is in a commanding position to control things effectively and make things happen. Thus, he carries a heavy responsibility on his shoulders.

1.4. MANAGEMENT OF MATERIAL RESOURCES

Materials management is concerned with the management of material resources. It considers the cost we incur on materials and seeks to reduce this cost.

Traditionally, we think of the cost of materials in terms of the price we pay to acquire the materials, that is, their basic cost. This is what we see in the statements of a company’s annual accounts. This cost, by itself, is enormously high, as materials account for 50 to 60 per cent of the net price of a product. The materials purchase function is particularly important in the present scenario because most of the industries of the engineering type such as automobile industry purchase 90 to 95 per cent of items through vendors and fabricate 5 to 10 per cent in house. These 5-10 per cent items represent the core competency of the industry. The purchase manager has been called “External Production Manager” by Gopalakrishnan.

Today, however, materials management takes into account not only the cost of materials, but also the cost we incur on materials. There are, therefore, two
distinct and different costs relating to materials. According to K.S. Menon, cost of materials and cost on materials should be minimized.

In fact, the costs on material in many cases are hidden costs, since they are not classified under the head ‘materials’ in a company’s accounts. Instead, they go under misleading headings, like overheads, scrap, storage costs, and indirect labour, and so on. The main thrust of materials management is to attack all these hidden costs on materials wherever they may occur.

Some of these costs which get added to the basic cost incurred on buying materials are.

- Cost of purchasing: This can be very high if we have cumbersome and bureaucratic purchasing procedures.
- Taxes: Sales tax, excise, octroi, etc.
- Packing costs.
- Transportation costs, including clearing costs, incurred at railheads, ports, airports, etc.
- Insurance premium.
- Receiving.
- Inspection costs.
- Materials handling costs.
- Loss caused by scrap and cost of re-work.
- Loss suffered on finished goods rejected by quality control.
- Inventory carrying costs, consisting of interest on capital looked up; salaries payable to staff required for store-keeping and stores accounting; amounts payable towards rents, taxes, insurance premium; loss caused by pilferage, spoilage and deterioration, obsolescence, etc. In India this cost works out to approximately 30 per cent per annum of the basic cost of materials stored.
A distinctive feature of these costs (except maybe taxes) is that none of them adds any value to the final product and hence should be accounted for. All these costs are variable and controllable, and every rupee saved on them adds to the profits of a manufacturing enterprise, or brings about a reduction in the cost of services rendered by a service organization.

The most important fact about materials management is that, it is a joint corporate responsibility which has to be equally shared by various interrelated functional departments of a manufacturing company such as sales, production, design, accounts, transportation, legal, maintenance, quality control and, of course, purchase and stores.

Take finished goods, to start with. Their stock limits are usually determined by the sales department. Most sales personnel do not realize the implications of keeping high stocks of finished goods or stocks of obsolete items. Sales personnel are well known for their attitude towards the ‘important customer’ whom they must satisfy ‘at any cost’. So the tendency is to always keep high stocks and also to maintain stocks of accessories and parts which have become obsolete because of subsequent changes made in the design of a product. Let us take an example. Trucks, manufactured by the Tatas today, have a number of features which were not there 25 years ago. Some of the changes in the design were made 15-18 or even 20 years ago. Since a large number of 20 years-old truck are operating even now, it can be understood that high cost is incurred by a manufacturer if he is keeping large stocks of obsolete truck parts and accessories in order to satisfy his customers.

Further, materials should not become the concern of materials department alone. Presently, production department is concerned only with production of maximum batch sizes in a single production run. The maintenance department is concerned with keeping maximum spares for critical mother machines, so that
they are kept in running condition. Sales people make their forecast and want production to make enough quantity to match the forecast. Any error in forecast affects the level of raw material or finished goods inventory. Thus, even though procurement and storage of materials or finished goods inventory. Thus, even though procurement and storage of materials is the major objective of the materials management department, a system approach or an integrated approach demands that ‘material’ should become the concern of all departments.

1.5. CONCEPTS OF MATERIALS MANAGEMENT:

The organizational approach known as materials management has gained validity in recent years. Production and Operations managers found it necessary to develop an organized body of knowledge related to planning, acquisition and utilization of materials in the process of production and it has resulted in the discipline known as “Materials Management “. All activities involved in bringing materials into and through the plant are combined under one head known as “Materials Manager”. By giving the materials manager overall authority, responsibility is centralized to assure that the overall cost of materials is kept at lowest possible level. The basic rationale for this organizational change is to overcome the problem of conflicting objectives. For example, purchase department’s concerned to ensure continuous supply of component materials may conflict with the inventory control department’s objective to minimize inventory levels or the objective of shipping in full car load lots.

Today organizations view procurement as a professional activity including activities involved in obtaining materials at minimum cost, transporting them and providing storage and moving toward the production process. It also includes economic analysis of supply (i.e., purchase economics), demand and prices and the assessment of international events that affect materials.
The majority of the industries, input materials constitute about 50 to 60 per cent of the sales turnover achieved through sales of finished products. A major part of the fixed capital in manufacturing firms is in plant and machinery and a substantial part of the working capital is in raw materials, component parts and supplies. All these have been acquired through the purchase function which is one of the functions of materials management. Because of this importance of materials management, it is worth-while to discuss two concepts of materials management namely:

(i) Profit-Center Concept and (ii) Integrated Concept.

**Profit-Center Concept:** Purchasing which is a part of materials management is responsible to buy materials of the right quality, in the right quantity, at right price, from the right source with the delivery at the right place. This objective must be achieved with a minimum investment in inventory by balancing the risk of stock-out and production stoppage, the cost of forward and buying and the economics of quantity purchases. Another objective is the maintenance of adequate quality of bought-out materials. Also, the other objectives are: avoidance of duplication, waste and obsolescence with respect to various items purchased etc. Thus the purchasing manager has the objective of sustaining the company's competitive position by reducing costs and ensuring quality of materials.

To achieve the above objectives, purchasing (and hence materials management) can be viewed as a "profit centre". Any stock-out and the resulting loss of production is treated as a loss. The reduction in price of bought-out materials by right sourcing is considered as a profit. Any saving due to avoidance of wastage and obsolescence adds to profit. Reduction of inventories without affecting production adds to profit by reducing inventory carrying costs. Since materials department is considered as a spending department (i.e., cost centre),
every rupee saved on purchasing is a rupee earned (i.e., profit). For instance, many Japanese companies have the slogan “we live by sales, but make our profit from materials”.

Materials managers can significantly contribute to the profitability of their firms by implementing scientific techniques which can result in decreased working capital, less cash outflow and hence increased profit or reduced costs. For instance, materials managers can effectively contribute to import substitution and save valuable foreign exchange for the country.

**Integrated concept:** Materials management involves various functions such as materials planning, purchasing, receiving, storing, controlling inventory, and disposal of surplus and scrap. These functions are interrelated and cannot be handled independently. For instance, if the purchase department operates independently, it may take decisions which are sub optimal. For example, an independent purchase department may decide to buy large quantities of an item taking into consideration the discount offered by the supplier. But this decision may have an impact on the storage and carrying costs and also the storage space may become inadequate. On the other hand, if the purchase department decides to buy in small lots, the purchase price will increase and stock-out conditions may occur at times.

In an integrated approach, the materials manager is responsible for all interrelated activities concerned with procurement, storage, and utilization of materials, and he or she can exercise control to ensure proper balance of conflicting objectives of the various functions of materials management.

**Some of the advantages of integrated materials management concept are:**
(i) Better accountability through centralization of authority and responsibility for all aspects of materials function.
(ii) Better coordination between materials management department and user departments.

(iii) Better performance due to better communication and coordination between materials planning, purchasing, stores and inventory control departments—all of which are integrated organizationally under materials management department/division.

(iv) Use of electronic data processing (EDP) by centralizing the materials functions, all information regarding materials can be centralized under one material management information system (MMIS). This facilitates collection, collation and analysis of data leading to better decision.

1.6. SYSTEMS APPROACH TO MATERIALS MANAGEMENT

The integrated concepts of materials management views various functions of materials management such as materials planning, purchasing, storing and inventory control as interdependent functions which are integrated under materials management function. This concept is extended to view materials management as sub-system of a larger productive system.

A system may be defined as any group of interrelated parts or components which function together to achieve some stated or predetermined goals. A large productive system is viewed as a social system as well as a technical system having many divisions/departments each of which is a sub-system of the total productive system. For instance, a productive system has four distinct and essential parts, namely (i) Input (ii) Conversion process (iii) Output and (iv) Control.

The output is connected to the input through a feedback loop to facilitate control and to take corrective measures when needed to achieve the desired goals.
A business organization or a productive system is regarded as an open system (not a closed loop system) because it does not operate independently of its environment and also it is affected by external environmental factors (variables).

When a systems concept is used as frame-work for managing materials (one of the major inputs), it can be observed that materials management not only interacts with its external environment but also interacts with other components of the system.

Since materials management involves an integrated process of materials flow, into, through and out of an organization (i.e., productive system), it can be viewed as having two kinds of interfaces

(i) Internal and (ii) External.

The internal interfaces include market forecasting, production, finance, inventory control, inspection and quality control, materials handling, traffic and physical distribution logistics and the material flow process.

The external interfaces include customers (or consumers) and suppliers/other companies.

The systems approach to materials management has the following benefits:

(i) Reliable and accurate performance to achieve the desired results.
(ii) Strict adherence to plans and schedules (i.e., by effective utilization of resources such as materials, machines, labour and finance).
(iii) Timely and optimum procurement of materials.
(iv) Optimum inventory turn-over ratio.
(v) Good vendor-vendee relations (supplier partnerships).
(vi) Optimum supply and physical distribution logistics.
(vii) Control of overall costs of materials.
(viii) Coordination of various materials management functions.
(ix) Elimination/minimization of duplication of functions related to material management.
(x) Resolution of conflicts through centralized authority and responsibility for materials

1.7. IMPORTANCE OF MATERIALS MANAGEMENT

Materials management is one of the basic functions of every business. Along with the other traditional functions like Marketing, Human Resource Management, Finance and Manufacturing, it has equal contribution to triple objective of survival, stability and growth in any healthy business. The economic success of any manufacturing company has a direct relationship with the efficiency of its materials management function. Since any organization can only have a limited amount capital to be invested in its fixed and current assets. One of the core responsibilities of every management is to deploy these critical resources so as to give the maximum yield to the organization. An average manufacturing organization in India has approximately 80% of its current assets invested in inventories with the rest being in secondary depths, cash and other miscellaneous items. Thus, it is quite evident that successful materials management can contribute immensely to improve the efficiency of working capital employed in an organization.

Inventories are nothing but cash stored up. The vital difference between this “Cash” and conventional cash is that, while the farmer does not earn interest but on the hand requires additional fund for servicing it, the later can be utilized in any fashion that the owners desire. The cash which is utilized for buying raw materials has to flow through process of being converted into work-in-progress and subsequently finished goods. As and when these finished goods are sold and dispatched to customers, the organization gets back its cash in the form of
accounts receivable. Payment of these dues by the customers give back to the organization, that the cash which had gone into the procurement of the raw materials originally, and same surplus cash is generated. This is what is commonly known as the ‘cash cycle’. Every healthy organization always strive for a reduction in the total duration of the cash cycle and thus achieved an accelerated pace of its turn-over. The rate at which the cash turns back into cash is one of the measures of the efficiency of the organization.

In addition to ensure a greater efficiency of its working capital management, the materials manager can also substantially contribute in improving the profit as well as the rate of return on investment in the organization. Since in a typical manufacturing organization, materials constitute around 50 to 70% of the total sales volume and the profit margin is of the order of 5 to 10% marginal reduction in the materials cost by even 2% would result in the profit going up to by around 10-15%. Thus, by an effective control over the cost of materials going into the product, the materials manager can directly contribute to profit, an account which would require practically 6-7 times the efforts of the marketing manager for increasing the sales. Since materials account for a major portion of the total working capital needed at any time, the role of the materials manager gains added importance in time of stringent credit conditions.

Out of all the resources available to the management of an organization viz., Men, Machine and Materials it can also be appreciated that it is the only the last, namely Materials, which is the most amenable to control. Changes in Men or Machine require a long lead time which may even be of the order of 5-10 years, while on the other hand materials which account for more than half of the product value can be controlled in an easier manner and over a much shorter time span.

It has also to be emphasized that effective inventory management is a compressive concept which spans more than the materials management
department of any organization. The activities of other functional areas like design, engineering, manufacturing, quality control, production planning, industrial engineering, finance and accounts and in effect all departments have a direct bearing on the inventory management in the organization. If the effective management of materials and inventories of an organization are so important to its success, is it not shocking that so little is known to manage them? This vividly manifest the great importance and role of materials management function in the well being, and efficiency of the organization, particularly with reference to private sector under taking.

1.8. MODERN TRENDS IN MATERIALS MANAGEMENT:

Studying flow of materials – the acquisition, storage, movement and processing of raw materials, components, assemblies – is a good way to understand manufacturing. Also, services such as retailing, warehousing and transportation companies can be viewed as systems of materials flows. In these systems, all organizational functions are greatly affected by the planning and control of the materials system.

**Supply Chain Management:** A supply chain refers to the way materials flow through different organizations starting with basic raw materials and ending with finished products delivered to the ultimate customer. It consists of a sequence of suppliers, warehouses, operations, and retail outlets.

Supply chains form complex networks involving many companies and materials co-ordination of all companies involved in a supply chain (including effective communication) is crucial to providing high quality finished products in a timely manner at the lowest possible cost. The most relevant aspects of supply chain management involve all management functions related to the flow of materials from the company’s direct suppliers to its direct customers including
purchasing, warehousing, inspection, production, materials handling and shipping and distribution.

Materials Management and Logistics managements are two alternative names sometimes used to refer to supply-chain management within a single firm. Some organizations have centralized their diverse materials management functions under one department headed by a materials manager or supply chain manager or director – materials management.

Four important activities in materials management or supply-chain management are purchasing, logistics, warehousing and expediting. Logistics management is the management (i.e., the planning, execution and control) of all factors that affect the materials flow and the information about it, seen from the perspective of customer requirements, for the purpose of achieving high delivery reliability, a high degree of delivery completeness and a short delivery time.

Logistics management function involves short – term materials planning, the supply of raw materials and other purchased goods, internal transportation, storage and physical distribution. It is sometimes also referred to as materials management and/or integrated business logistics.

Supply chain management is a systems approach to viewing the supply channel and distribution channel as a whole rather than a set of fragmented parts. It differs from traditional approaches on inventory control and focuses on management of inventory through the entire supply chain. Successful supply chain management relies on forming strategic partnerships with trading partners along the supply chain.
Supply chain management should be considered as a logical extension of the logistics concepts. In order to be able to manage cost throughout the supply chain, effective and cooperative supplier relationships are required. Hence, purchasing and supply management (including supplier management) can be viewed as an integrated part of supply chain management which encompasses both the logistics and the purchasing and supply function.

1.9. CHALLENGES OF MATERIALS MANAGEMENT:

The Challenges before Managerial management in industry may be summed up as follows.

1. Scarce capital for investing in material inventory.
2. Difficulty in forecasting demand accurately.
3. Increasing cost of land and storage space.
4. Selection of appropriate vendors.
5. Optimizing purchasing quantity of materials.
6. Diversification of product lines.
7. Optimizing time and quantity of demand for products.

As the present study concerns itself to materials management in Cement Industry, the researcher feels it necessary to provide a brief detail of Cement Industry in India at this stage.

1.10. CEMENT INDUSTRY IN INDIA

Modern civilization lives in Concrete jungles denote the life in cities. It is no doubt that concrete jungle is the culminated expression of too many variables to all branches of knowledge. No doubt Cement industry is the prominent Industry in urbanization and one cannot imagine the modern civilization without Cement. Cement industry belongs to the key infrastructure industry. This industry witnessed controlled regime in the beginning and even branded as pro-rich. It has been decontrolled from price and distribution in 1st March, 1989 and delicensed on 25th July 1991. However, the performance of the industry and prices of cement are
monitored regularly. The constraints faced by the industry are reviewed in the Infrastructure Coordination Committee meetings held in the Cabinet Secretariat under the Chairmanship of Secretary. Its performance is also reviewed by the Cabinet Committee on Infrastructure.

The cement industry in India is comprised of 148 large cement plants with an installed capacity of 230.27 million tones and more than 365 mini cement plants with an estimated capacity of 230 million tones per annum. The Cement Corporation of India, which is a Central Public Sector Undertaking, has 10 units. There are large cement plants owned by various State Governments. The total installed capacity in the country as a whole is 159.38 million tones and Actual cement production in 2008-09 was 216.35 million tones as against a production of 106.90 million tones in 2001-02, registering a growth rate of 8.84%. Apart from meeting the entire domestic demand, the industry is also exporting cement and clinker. The export of cement and clinker during 2008-09 was 10.14 million tones and 6.92 million tones respectively. Major exporters were Gujarat Ambuja Cements Ltd, and L&T Ltd.

For the development of the cement industry ‘Working Group on Cement Industry’ was constituted by the Planning Commission for the formulation of XII Five Year Plan. The Working Group has projected a growth rate of 10% for the cement industry during the plan period and has projected creation of additional capacity of 40-62 million tones mainly through expansion of existing plants. The Working Group has identified following thrust areas for improving demand for cement:

- Further push to housing development programmes,
- Promotion of concrete Highways and roads and
- Use of ready-mix concrete in large infrastructure projects.
Further, in order to improve global competitiveness of the Indian Cement Industry, the Department of Industrial Policy & Promotion commissioned a study on the global competitiveness of the India Industry through an organization of international repute viz., KPMG Consultancy Pvt. Ltd. The report submitted by the organization has made several recommendations for making the Indian Cement Industry more competitive in the international spheres and also the recommendations are under consideration of the government.

TECHNOLOGICAL CHANGE

Cement industry has made tremendous strides in upgradation and assimilation of latest technology. At present ninety three percent of the total capacity in the industry is based on modern and environment-friendly dry process technology and only seven percent of the capacity is based on old wet and semi-dry process technology. There is tremendous scope for waste heat recovery in cement plants and thereby reduction in emission level. One project for cogeneration of power utilizing waste heat in an Indian cement plant is being implemented with Japanese assistance under Green Aid Plan. The induction of advanced technology has helped the industry immensely to conserve energy and fuel to save materials substantially. India is also producing different varieties of cement like Ordinary Portland Cement (OPC), Portland Pozzolana Cement (PPC), Portland Blast Furnace Slag Cement (PBFS), Oil Well Cement, Rapid Hardening Portland Cement, Sulphate Resisting Portland Cement, White Cement etc., Production of these varieties of cement conform to the BIS Specifications. It is worth mentioning that some cement plants have set up dedicated jetties for promoting bulk transportation and export.

As the present study relates to Materials Management in cement industry, it is felt necessary to provide a detailed conceptual and functional frame work of materials management and also a detailed analysis of growth and development of
cement industry in the world, in India, and in Karnataka. Chapter -II provides a conceptual and functional frame work of material management and Chapter-III presents growth and development of cement industry in the world, in India, and in Karnataka

1.11.REVIEW OF LITERATURE:

This part of the thesis presents a review of the available literature on the topic under study. Though the literature is rich in the field of Materials Management in general, it is not so in the case of Cement Industry. The review of literature throws light in the organized manner on all the areas of Materials Management and also on Cement Industry. In review of literature more weightage has been given to articles, journals, books and websites, by keeping objectives of the Study as the nucleus. Chronological order has been maintained to bridge from past to present.

Vera Anstey and Russi J. Taraporevala (1950)\(^1\) in their article Some Aspects and Structure of Indian Industry have analyzed the Indian Industrial Scenario particularly with reference to 28 industries. According to their opinion Cement Industry topped the list with tanning industry at the bottom.

David A. Collier (1952)\(^2\) of Duke University in his article A Comparison of MRP Lot Sizing Methods Considering Capacity Change Costs opined that the Capacity management is the planning and leveling of resources required (load) against the resources available (capacity). In this study, the lot size models used by Material Requirements Planning (MRP) had a major effect on the work center load profiles generated by Capacity Requirements Planning (CRP). Therefore, the selection of lot size models for MRP systems is an important decision for capacity management as well as materials management.

The results of this study highlight the operating characteristics of specific lot size models considering setup, inventory carrying, and capacity associated costs. For example, the Economic Order Quantity model and the Lot-For-Lot model in certain situations can help level load. The Periodic Order Quantity and Least Total
Cost models especially for high cost structure ratios tend to result in erratic and lumpy work center load profiles. The reasons for such operating behavior are examined. Other concepts and relationships important to capacity management are discussed.

Roase De (1956) in his article **Impact of Materials Management on Quality** stressed that Materials Management is planning, controlling and coordinating of all those activities concerned with materials and inventory requirements, from the point of their inspection to their introduction to the manufacturing process. It begins with the determination of the material quality and quantity and ends with lowest cost.

In this Henderson (1961) in his work **Material Costing** observed: “the cost of material is an important element in manufacturing. Some authorities claimed that on the average it amounts to 20% of all corporation assets. The proportion of total manufacturing cost paid for material varies widely among industries-between 20 and 90% averaging about 55%.” It is a truism that management as old as civilization itself. It originated when man started storing food for future consumption. Therefore the initiation to material management took place through storage function. When exchange and trade crept into faster growth of civilization, the purchasing function was also added to storage function. With the advent of industrial revolution, the need for a separate identity for each of components materials activity was felt.

In this regard, Fearon and John (1963) observed that purchasing existed as a separate and in railroad by 1887. However, this approach of purchasing activity having its own identity came to manufacturing firms some-what later.

Teague (1963) his article **The crux of Materials Management** opines that Materials Management establishes the requirements and it provides the availability, determines the value and the price levels and controls the flow of the materials from the initial development of the production requirement (coming
from the receipt of the customer order or from the marketing schedule of anticipated sales) until the final delivery of the product to the customer.

Palit (1964)\(^7\) in his article **Optimality and Material Management** viewed, a proper materials management helps to lower cost and releases substantial amount of capital with less effort and time than any other area of management.

Cowen (1966)\(^8\) in his article **Effective Cost Control Tools** argues that higher the material cost in total cost structure, higher would be the scope for cost control.

Palit (1966)\(^9\) advocated the relevance of the materials management to specific areas like marketing and the role of materials management in exports. Further, he stated that inter-departmental co-operation and co-ordination of activities and an integrated approach to materials management in the light of the overall objectives were the essential ingredients of materials management, and of overall success.

Further, the 14\(^{th}\) report (1967)\(^10\) on **Materials Management inferred** that “if the inventory of industrial running concerns could be reduced to 5 months productions which would by no means be difficult it would mean realize of 104 crores”.

Cooper (1967)\(^11\) was of the view that materials management had to be elevated to the place of major function of industrial management in every industry, irrespective of whether a unit was in public sector or in private sector.

According to the 40\(^{th}\) Report (1967)\(^12\) on **Contemporary Industrial Practices**, materials management covers the efficient management of material in all its aspects, affecting the flow, the conservation and utilization, and the quality and the cost of materials.

In the words Similarly, Menon (1968)\(^13\) in his article **Prime Cost Components** observed that the material cost was about 66% with labour cost accounting for 16% and overheads forming about 18% and hence 10% reduction in material cost would be resulting in a saving of 6.6 paisa in a rupee as against
10% reduction in labour cost and overheads having a saving of only 1.6 paisa and 1.8 paisa respectively.

Agarwal (1968)\textsuperscript{14} made an analysis of the functioning of materials management in Indian industries and observed that there was no single well accepted organizational pattern in Indian industries.

The studies by Kinra (1968)\textsuperscript{15} related to the role of materials and the precautions to be taken by the Government in implementing proposals under Five Year Plans. He observed that more than Rs.5,000 crores were spent on materials and stores out of the total outlay of Rs. 11,710 crores representing more than 42.70 percent of the outlay during the first three plan periods. Further, he also quoted that materials represented 64.00 percent of manufacturing cost in twenty-nine major industries. Lastly, he outlined certain measures like sound organizational structure, standardization, rationalization, codification and value analysis as a package of materials management practice, which could bring down the material cost substantially leading to higher efficiency level.

The study team of \textbf{Public Sector Undertakings} (1974)\textsuperscript{16} based on its own study and the reports of the Parliamentary Committees and expert teams of the Planning Commission pointed out that lack of materials and delays in delivery resulted in undertakings. Moreover several public undertakings did not have proper storage and handling facilities or a proper system of physical verification and stores accounting. It further pointed out that in many undertakings, purchases procedures were lengthy and involved a large number of references to the financial branch.

Agrwal (1968)\textsuperscript{17} considered the materials management as a profit centre for the top management. However, the materials management was given a secondary place in top management.
Balla (1968) in his article *Impact on Material Costs on Productivity* argues that substantial productivity increases can be achieved through better utilization of materials.

Further Moore (1969) in his article “*Materials- The Life Blood for an Organization*, observes that in majority of business enterprises, material represent a large portion of total investment.

As such, the investment in materials should be subjected to rigorous control.” Gokrn (1970) in his article *Critical Issues in Materials Management* viewed “Materials Management covers the whole range of function involved in converting raw materials and ancillary supplies into finished products”.

In this regard, Ammer (1970) Materials *Purchase Function* observed that some firms did not have strong independent purchasing of materials activity as late in 1950 and the normal feature was that each for man was its own material manager, author continues that “when most of the functions related to material management are grouped together organizationally, the purchasing manager becomes a material manager infact, if in title. Eventually management recognizes that the function being performed in purchasing department is no longer purchasing but something else, materials management. They recognized this by changing the purchasing manager title to “Material managers.”

The study team of Asian productivity Organisation (1971), which visited Japan to study the materials management practices in various industrial organizations stated the various special features of materials management in that country.

In the wards of Ballot (1971) *Controlling Mechanisms of Materials* opined that “Taylor provided for the material management functions long range planning, production control, inventory control and scheduling as well as other operational tools such as quality control, industrial engineering, cost control and standardization of operations and procedure.” However it is still believed that material management is an extension of purchase management. The cost saving
potential of materials has also been highlighted by a few practitioners and experts in the field.

Mukherjee (1972)\textsuperscript{24} Profit Maximization through Materials Management states that material management is a profit center of great importance in industries where 40 to 50\% of the cost of production is in materials and where the entire working capital is in inventory.

According to Golearan (1975)\textsuperscript{25} in his article Scope of Materials Management Material management offers a wide scope for reducing costs, saving foreign exchange, conserving source materials, improving productivity and increasing profits. Another source for understanding the potential role of material management has been the potential benefit derived from the application of specific concepts and techniques in Materials Management.

Rao (1975)\textsuperscript{26} brought out the relationship between finance and materials management in public sector enterprises. He advocated for the attention to be focused on the areas of purchase procedures, and store procedures.

Baijal (1975)\textsuperscript{27} Standardization of Material Costs observed that standardization of stores item will go a long way in reducing the number of items to be stored and in that case the total inventories can be reduced substantially.

According to Reserve Bank of India (1976)\textsuperscript{28} survey, the material cost varied between 60\% and 90\%.

Joshi (1977)\textsuperscript{29} in his article CBA in Production Management opines that if cost benefit is applied to different Management activities, material Management activities, material management is an area which needs most important attention.

Bansal (1976)\textsuperscript{30} explored the status of the materials management in Bharat Heavy Electrical Limited, Bhopal. The study revealed that the holdings of raw materials, components and spares for production and operation were above their actual consumption level. The inventories in general were found to be above their routine requirements. The holdings of stores and spares generally were of the order of two to three years requirement. There was very little automatic
replenishment system in the undertaking. No proper review of the ledger cards were made by the undertaking. No substantial information in the form of regular statistics or statements was maintained in the undertaking regarding inventory information to be fed to the for the top management for control. In most of the cases of the recruitment, the staff and officers of other departments having no knowledge whatsoever were transferred to stores and purchases departments. Reconciliation of the stores ledgers with accounts ledgers in most of the cases resulted in differences most of the times. The major findings of the study were the following: (a) the total cost of the material accounted for 40.00 to 60.00 percent in the total cost of production and the cost of the inventories varied between 40.00 percent and 85.00 percent of the total current assets during the period of study; (b) though the company had ancillary units, it failed any all means in entrusting sufficient workload; (c) The delay on the part of the suppliers in supplying materials substantially and frequently affected the production programmes which resulted in the slippages in the achievement of production targets; (d) major portion of the company’s finances running into corers of rupees was locked up in the form of surplus and non-moving items; (e) an analysis of inventories vis-à-vis norms laid down by the Bureau of Public Enterprises revealed that inventory accumulation in the company was relatively higher in the beginning of the period as against the later part of the period under study. The major suggestions of the study consisted of opening a liaison office in relevant countries, encouraging ancillary units, intensification of value engineering, standardization and staffing of materials department with technically qualified personnel.

Material Requirement Planning Systems Development by James F. Cox and Stephen J. Clark (1977) in their article Material Procurement for Effective Production Management viewed that Materials Management is more a dependent demand management. Information relating to the market demand will help to procure sufficient materials which leads to materials requirement planning.
Somayajula (1977) observed: “The successful functioning of any industry depends to a large extent on the sound working systems adopted in the materials management.”

Similarly, Muzumdar (1978) in his article *Incremental Change in Material Costs* observed that the materials cost accounted for more than half of sales value of a product and even a small change in the material cost could change save or drain away a large amount of money.

Reviewing the research in Material Management taking place in the United States, Smith and Jagetia (1978) in their article *Inventory Control System* started that 50.00% of the savings were achieved by single inventory control system, which reduced 20.00% of annual inventory investment. The American Management Association started that the adoption of one scientific inventory control technique, namely the economic lot size in place of purchase as judgment basis was responsible for reduction in total inventory investment by 20.00% to 30.00% without sacrificing customer service. Similarly, Gopalkrishnan and Sandilya (1978) in their article *Standardization Techniques for Materials Management* observed that some of the leading firms in England reduced their number of inventory items by 40.00% and the American firms by 55.00% through the application of standardization technique.

A. G. Slater (1978) in his article *Developing Materials Management* posed fundamental questions on procurement philosophy and viewed that sub optimization in production is more due to poor implementation of the principles of materials management.

Datta (1978) in his article *Mastering Materials- A case Study of Paper Industry* opines that “Materials Management is essential an activity of an enterprise for the procurement and use of materials distinctly separated from the process of procurement and use of human skills from labourers for the ultimate development to attain some predetermined objectives. ” in his article author
examined the importance of managing materials to paper industry by studying the case of Altanta Paper Mills.

GopalKrishnan and Sudarshan(1979) in their article Managing Materials-Contemporary Challenges opines that “Materials Management is the function responsible for the co-ordination of planning, sourcing, purchasing, moving, storing and controlling material in any optimum manner so as to provide pre-decided service to the customer at a minimum cost”.

Gopalakrishna and sundaresan (1979) explained that the integrated materials planning, purchasing and procurement planning, inventory control, stores custody and operation and salvage and disposal. According to them, if functional responsibilities were kept independent from each other, they led to conflict of interest resulting in inventory buildup and therefore integration in turn, would result in greater coordination and better control. Further, while discussing the materials management in the background of Indian conditions, the authors listed seventy-six indices to evaluate materials management planning and forecasting efficiency, inventory and stores, standardization, codification and value analysis, transportation analysis, transportation and distribution and twenty-five questions that become useful in any enquiry on materials management.

Sharma (1980) in his work Materials Management in Steel Industry described at length the core principles of Materials Management. In his words Materials Management concept under the organizational frame work includes the planning and policy activities covering a wide range of related and complimentary activities, including store keeping, inventory control, salvage and reclamation, value analysis and such activities as the research developments required for proper selection of materials and the source of supply from which there materials may be brought, the follow up procedure necessary to ensure proper delivery, the inspection of incoming shipment to both quality and quantity, compliance with orders placed, the development of proper procedures, methods and forms to enable
the department to carry out established policies and to co-ordinate with other internal division such as traffic, receiving, storekeeping and according to facilitate the smooth operations."

In nutshell it is important to note that all these definitions imply the changing concept of material management and the change is essentially the result of changing economic scene the world over. However, this euphonic rule of material management has not come to the stage of evanescence, because it is the only potential choice, master spirit and energizing strategy of managing development. The emphasis of strategy in development has often been highlighted through "cost reduction", which has been considered to all the potentiality to achieve the objective. The cost reduction may be possible in three broad areas, viz, materials, labour and overheads, but the potential for cost reduction lies in materials alone. Looking at the impossibility of labor as a source for the cost reduction,

Donald F. Blumberg (1981)\textsuperscript{41} in his article \textit{Management systems for Field Service Productivity Improvement} opined that the technology adopted in the production must be more efficient but cost effective and Management Information System is only a tool which helps in decision making. William B. Rao and Prasad (1981)\textsuperscript{42} made an attempt to study the level of inventory and its management practices in five public sector undertakings in Andhra Pradesh for the period between 1969-70 and 1978-79. They observed that (i) on an average, inventory represented around 62.00 per cent of the total current assets during the period; (ii) investment in inventories rose from Rs 8.65 crores to Rs 21.00 crores during the decade representing an increase of 147.36 per cent; (iii) The ratio of inventory to cost of production varied between six and eleven months' consumption and the ratio of inventory to sales varied between 1.5 and 2.5 months; and (iv) inventory constituted a sizeable portion of the working capital and it resulted in persistent loss due to inefficient management. The authors observed that the restructuring of organizational setup and adoption of modern inventory control techniques, which were non-existent in the undertakings, would
go a long way in reducing the excessive inventory investment resulting in substantial material cost reduction.

Wagner (1981)\textsuperscript{43} in their article \textit{Changing Industrial Buyer-Seller Pricing Concerns} viewed that increased uncertainty parameters rule the entire spectrum of pricing process.

Requirements Planning Systems in the Health Care Environment by Earle Steinberg, Basheer Khumawala, Richard Scamell (1982)\textsuperscript{44} in their article \textit{Cost Containment in Hospitals Management} rightly identified the problem of cost containment in the management of hospitals. This article reveals disposable items, reusable items, high technology items and their role in the whole process.

Mathew (1983)\textsuperscript{45} analyzed the practice of materials management in Kerala State Road Transport Corporation for the period between 1965-66 and 1978-79. Observing that the materials management in the corporation was totally non-existent and disorganized, he made sweeping suggestions in the areas of organizational setup, materials planning, purchasing, store keeping and inventory control. The suggestions to change organizational setup included (a) a three-tier structure of materials management administration consisting of depots, divisions and a central office at headquarters; (b) classification of depots into A, B and C categories depending on number of vehicles allotted; (c) decentralization of authority for decision making at the divisional level; (d) A and B category of materials to be procured at the division level; (e) central store to stock only imported materials, critical items and other selected items with high unit cost and low demand; and (f) more powers to be given to the proposed post of the assistant controller (materials management services). From the viewpoint of materials planning, major suggestions included (a) the formulation of clear-cut procedures to be laid on yearly basis; (b) forecasts of various activities to be done primarily at the divisional level; (c) independence in materials planning to be given to sub-stores; and (d) adoption of exponential smoothing method to forecast accurate materials consumption. The suggestions on purchasing included (a) annual
contracting system for selected major items; (b) suppliers to deliver the materials directly to the divisions and central stores; (c) rating the performance of the suppliers and searching for new sources with an emphasis on ancillary units; (d) rigorous application of value analysis in body building, major repairs, fabrication work, purchase of non-proprietary items and multisource items; (e) enhancing the monetary limits for emergency purchase at the divisional level; and (f) preparing an independent purchase manual and using it by discontinuing the present practice of adopting the purchase manual of the State Government. Store-keeping was to be reorganized by (a) the three-tier structure with one central store, three or four divisional stores and sub-stores attached to all operating units; (b) updating the existing codification system; (c) adopting standardization and simplification to reduce duplication; (d) introducing periodical scrutiny of stock records; and (e) discarding the unnecessary stock records. The suggestions on inventory control included (a) strict adherence to ABC analysis; (b) detailed classification of spare parts into critical and non-critical items based on functional characteristics and stock-out costs; (c) basing of inventory control system for A and B items on optional replenishment policy; (d) adoption of annual ordering and staggered deliveries on selective basis; (e) discontinuing elaborate record keeping for C category items; and (f) simplifying and reliable suppliers and clear delegation of purchase authority.

R.P. Mohanty and R. Chandran (1984) in their article Goal Programming Applications for Some Problems in Materials Management presented a generalized goal programming model for use in the analysis of Material Management and also discussed at length the multiple conflicts Materials Managers often deal with.

Buffa (1984) in his article *Economies of Scale* observed that “although the overall demand for services has increased tremendously, service system can expand only by hiring more labor.” The result has often been massive problems of scheduling and army of individual workers. These have been few internal economies of scale, nor is there likelihood that there will be future economies of scale.

The *Report of the Central Institute of Road Transport* (1986) on road transport undertakings revealed that about Rs.940 crores were spent on materials alone accounting for about 34.00 per cent of the total cost on stores and 75.00 per cent to 78.00 per cent of the working capital was also locked up in inventories. The inventory carrying cost formed about 25.00 per cent of the average inventory.

Bhattacharya (1986) in his work *Contemporary Issues in Materials Management* observed;” in the present circumstances, the possibility of reduction in labor cost is very remote, as any efforts in this direction are best with services of industrial relations problem. Same is the case with overheads, which sticks to company like Leach. It continues to such blood to flatten it out even at the cost of the company and hence it is always uncontrollable and invisible.”

Dwight E. Smith Daniels and Vicki L Smith (1987) in their article *Maximizing the Net Present Value of a Project Subject to Materials and Capital Constraints* provided a new approach to the project scheduling problem and advised the effective use of constrained resources in project schedule.

Avraham Shtub (1988) in their article *The Integration of CPM and Materials Management* in project management integrated material management module to CPM analysis.

*Production Planning and Inventory Management in a Telecommunication Industry* by W.H.M Zijm and A. G. de Kok (1988) identified a number of methodological issues in their experimental study for a medium sized telecommunication company in Netherlands. The concepts like MRP, ORP, OPT, HPP and others were well developed by the authors.
Peter Johnes (1988) in his article *Quality, Capacity and Productivity in Service Industries* argues that productivity is largely determined by the interrelationship between inputs and intermediate outputs.

Ramaswamy (1988) explained the application of management by objectives concept in purchasing. He identified development of vendors, improving quality of incoming materials, reduction of purchasing cost, and improvement of inventory control as the key areas.

Jones (1989) Stages in Materials Management proposed capacity management model with Stage I, Stage II and Stage III. Materials Management in Large Scale Projects.

Some Concerns and Research Issues by Ewdard A. Silver (1989) in his article *Cost Effectiveness in Projects* made a empirical study of construction industry and identified the significant contribution of materials management leading to the cost effectiveness of the projects.

The study by Mishra (1989) related to inventory management practices followed in the cement companies of Rajasthan for the period between 1982-86. The study revealed that the cement companies in Rajasthan had not so far given proper attention to inventory management. The other major conclusions of the study were the following: (a) Material requirement planning was done on the basis of the past consumption. (b) The functions of inventory management differed from plant to plant, and they had structured inventory organization internally on the basis of functions and sub-functions. Some plants adopted the functional organization and some others adopted location organization for inventory management. (c) Although various classification techniques such as ABC HML, VED & FSN were being used by these concerns they lacked precision and concerted regular action. What these companies were doing in the name of ABC analysis, infact was HML classification based on unit price of an item. (d) Inventory levels for different items were not compared against the standards set. (e) There was no objective fixation of Economic order Quantities and the decision
concerning order quantities was dominated by the factors like transportation and governmental restrictions on stock limit. (f) Most of the materials managers believed that the determination of Economic Order Quantity was an exercise in futility because of the uphill task involved in determining the order quantities. (g) The pricing of materials issues varied from plant to plant and the accounting treatment of disposal of waste was taken as a separate income resulting in presentation of high material cost in published reports. (h) Regarding storage, closed system was followed for delicate and high value items like spares, and open system was followed for bulky items like limestone, coal, clay and gypsum. (i) Even though single bin system was used, more items were found to be stored in each bin. (j) No provision was made for FSN analysis. (k) Lastly, most of the techniques of materials management were non-existent in the plants.

The suggestions included (1) the preparation and adherence to materials budget; (2) integrated organization; (3) All-India based standard codification and classification; (4) and vigorous attention to ABC, FSN and EOQ analysis.

Further, Casson (1989) in his article Controlling Materials Costs observed that the cost of the purchased raw material and components which were always very important and often the largest single item of expenditure in manufacturing operation and they had more visibility for control than labour and overheads.

R. Van Dierdonck and G. Brandt (1990) in their article Materials Management in Service Industries distinguished the problems between manufactured and service industry and opined that most services are a bundle of material and non material components. Further they opined that in service industry the investment is more than the manufacturing industry.

Kale (1990) attempted to estimate the magnitude of aggregate inventory held by Indian corporate sector. According to him, total inventory holdings were about Rs. 31,000 crores during 1987-88 and the sales turnover was about Rs. 1, 21,000 crores. The inventory holdings represented nearly 931 days sales turnover. The inventory carrying cost amounted to Rs. 7,750 crores.
Sastri (1990) discussed the criticality of indigenization in engineering industry by taking a case study of drive assembly and concluded that the savings in cost through indigenization were very high.

Subhod and shamprasad (1990) discussed the material requirement planning and attempted to convey to the end users in the manufacturing industry the possibility of absorbing the uncertainties through performing re-planning and reallocation of planned materials.

Sen and Agrawal (1990) attempted to bring out the changing concept of materials management with emphasis on integrated materials management, computerization and scientific approach towards the same. The authors analyzed the problems of materials management faced in large public sector electronic industry and suggested a few methods to overcome these problems.

Vettath and koshy (1990) discussed the role of materials manager in Indian scenario, the importance of their profession and the need to market the purchase functions by defining the various aspects of marketing the purchase functions. Working on the hypothesis and analyzing the questionnaire, they brought out the view of materials manager on the purchase functions and the strategy for marketing the purchase function and suggested evaluation criterion for uplifting the materials manager’s professional status by effectively marketing the purchase functions.

Bahadur and Srivastav (1991) developed a methodology for vendor rating as a tool for minimizing the buyers risk in procurement under the Indian conditions.

Char (1991) discussed the importance and various benefits derived from proper materials handling in the industry.

Nath (1991) attempted to establish the close relationship between the financial resources and materials management and he felt that the increasing cost of materials could be mitigated by an intelligent and resourceful materials manager.
Shaw K. Chen and Maling Ebrahimpour (1991) in their article *Demand forecasting for a jewelry packing company*, pattern identification and assessment stressed the importance of package and opined that package is strategically important both for manufacturing and sales.

**Computerized materials requirement planning in manufacturing companies in Malaysia** by Mohd. Ezani and Mat Hassan (1991) in their emperical study presented the usage of computerized Materials Requirement Planning System in Malaysia manufacturing companies. Authors concluded in their article by stating that the contemporary practices have been practiced by Malaysian manufacturing companies.

Hau. L. Lee and Corey Billington (1992) in their article *Managing Supply Chain Inventory Pitfalls and Opportunities* described 14 pitfalls of supply chain management revealing all the pitfalls.

M.G. Speranaz and W. Ukovich (1992) in their article *A decision support system for materials management* based upon their study carried out at a large multi plant factory. Authors stress the importance of redesigning the materials management process to improve the performance of the factory.

In its annual survey, the Bureau of Public Enterprises (1993) identified low capacity utilization in public enterprises being responsible for huge inventory pileup, which increased from Rs. 890 corers in 1970 to 27,611 corers in 1992 and this represented an increase of inventory value by 20.95 times over the base year as against the increase of Rs.1, 814 corers in 1970 to Rs.1, 21,102 corers in 1992 in terms of cost of production, which witnessed an increase of 65.76 times over the base year. However, the value of inventory as number of days cost of production or sales decreased from 175 in 1970 to 83 in 1992.

Manji (1993) highlighted the material requirement planning by use of statistical methods of procurement of paints required for a massive structure built for oil and Natural Gas commission for extraction of crude petroleum at offshore of Bombay by making use of correlation and regression analysis.
Pathak (1993) brought out the relationship between economics and materials management and emphasized that the materials manager was required to remain in touch with the market forces of demand and supply and the price level.

Venkata Rao (1994) in his article *Cost Reduction Path for Manufacturing Firms* observed: “as such materials seems to be the only one, the most profitable at that for cost reduction. They have the advantage of being ‘non-human’ factor and are thus freely amenable to controls.” Therefore the area of materials management should for the appropriate strategy to achieve cost reduction and development management. Leaving apart the negative side of labour and overheads in cost reduction, the arguments for cost reduction through proper material management may also be witnessed. These arguments falls into the categorized, viz, the pervasiveness of material’s cost in cost structure and working capital composition on one hand and the potential of materials in cost savings on the other.

Prakash, Rao and Shukla (1994) identified the reasons for mounting inventory investment to be (a) lack of professional competence; (b) low capacity utilisation; (c) defective production planning; (d) protracted procurement; (e) ineffective purchasing function; (f) frequent interference by audit department; (g) defective tender system; (h) unplanned purchasing system; (i) lack of proper transport facilities; (j) frequent changes in government policies; (k) non-availability of certain input materials; (l) long manufacturing cycle; and (m) delay in consumer’s testing and inspection.

F.J. Erens and H.M.H Hegge (1994) in their article *Manufacturing and sales co-ordination for product variety* made a case study of Medicom a medical equipment manufacturing company. Authors stressed the importance of communication in the logistic process.

Alin Veronika, Leni S Riantini and Bambang Trigunarsyah(1995) in their article *Corrective Action Recommendation for Project Cost Variance in*
Construction Material Management discussed at length and opined that Material Management is not properly applied to the construction industry.

Cathy Owens Swift (1995) in his article Preferences for single Sourcing and Supplier Selection Criteria examined the supplier selection criteria and opined single sourcing is preferable to multiple sourcing.

Materials-Product Chains: Theory and an Application to Zinc and PVC Gutters by Patricia Kandellars and Jeroen Van Den Bergh (1996) compared the differences between products and services. Authors presented theoretical Materials-Product model for PVC gutters.

Ahmed Rizki (1997) in his article E-Reporting in Material Management opined that there is an immediate necessity for using modern technology in managing materials.

Farooq Ali (1997) in his article Developing buyer-supplier relationships in the automobile industry opined that the adoption of Japanese style practices has the most effective weapon for automobile manufacturers to sustain and enhance in the midst of severe competition.

Raw Material Management at Welch’s Inc by Edmund W. Schuster (1998) conducted a case study of Concord and Nayagara grapes and formulated a linear programme model as a spread sheet for the optimization in daily decision making.

Branko R. Babic(1998) in his article Health and Safety Issues in Cement Industry stressed upon health and safety issues at work to achieve low level of injury and disorders in cement industry with reference to United Kingdom. Author revealed the fact the astonishing fact that 25 per cent of all work related skin problems are linked to port land cement contamination.

Damodara U. Kini, P.E, (1999) in his article Materials Management: The Key to Successful Project Management opined managing materials can lead to greater savings.
Yue Yu, Kai Jin and Hong C. Zhang (2000) in their article *A Decision-Making Model for Materials Management of the End-of-Life Electronic Products* in their research paper brought to light the environmental impact, recycling scenario and other social cost variables from electric and electronic products. Industrial waste disposal for the concern of the authors and recommended prototype model.

Aman Ulla Bashar (2002) in his article *Cement Industry Back on the Track* expressed that with 8 per cent growth rate of the economy there will not be a slump for the cement industry. The lady luck has helped the sick firms in cement industry to come out with bold and timely decisions.


An assessment of supply chain and innovation management practices in the manufacturing industries in Turkey by Gunduz Ulusoy (2003) identifies the importance of supply chain and innovation management in the manufacturing industries in Turkey on an empirical basis. Author conducted primary investigation in 82 companies from four sectors in Turkey.

Measuring Effectiveness of Materials Management for Industrial Projects by Mohammed Al-Khalil and Sadi Assaf (2004) analyzed the problems confronted in the process of materials management by conducting a study on 17 ongoing industrial projects. Authors opined that modern firms adopt very cost effective practices of materials management.

Lieven Quintens (2006) in his article *Global purchasing: State of the art and research directions* identified the difference between opportunistic and strategic sourcing. Author strongly emphasized global purchasing as the last business function which has the potential for a double digit impact on the performance of the firm.
The Concept and theory of material flow by Shoubo Xu (2008)^93 introduced the new dimensions with material flow analysis. This research paper is based upon comprehensive material flow theory and also indicates six material flow elements like labour, material, finance, transport, natural forces and time forces.

Manish Saxena (2009)^84 in his article Indian Cement Sector-Stay in Bullish viewed by analyzing fundamentals of cement industry that Indian cement sector will experience a sustained up-cycle lasting atleast for a decade.

Shobhit Chandak (2009)^95 in his article Indian Cement Industry-Opportunities, Threats, Risks and Concerns opined that capacity utilization is maximum among all the firms in cement industry because of demand driven factors. Author identified the key sectors which are responsible for the demand driven situation in cement industry.

Shobhit Chandak (2010)^96 in his article Credit Agencies and their Impact on Cement Industry argued that lower credit ratings are not necessarily bad. Author viewed that the credit rating agencies are not always the yardsticks to determine the fate of the firm and the product. Further the ratings of Credit Analysis and Research Limited (CARE) ratings are better than others.

David W. Carroll, Brain Gasiorowski and Michel Picard and Dominique Bernard (2010)^97 in their article The World wide Cement Industry Sustainability Initiative conducted a survey of 160 international cement manufacturing companies and identified the strategic challenges before the firms and suggested the path for the sustainable development of the industry.

From the analysis of the above literature pertaining to different facets of Materials Management, it may be inferred that majority of studies focused on various issues but obviously throw very little light on the practical issues in Material Management in general and cement industry in particular. Studies concentrated more on the parameters with academic interest but not based on
practical orientation of field level information. Thus, the Studies are more
methodologically specific or approach specific and thereby, neglecting
comprehensive practical problems in cement industry relating to material
management. Survey of literature reveals that there is a good lot of literature in the
form of articles, reports and information in websites relating to conceptual and
functional areas of materials management. But there is a limited empirical research
available on materials management which shows that a very few comprehensive
research studies have been conducted in highly capital intensive industries like
shipping, steel, automobiles etc. Although there is some literature available on
cement industry relating to material pricing, material costing, pollution control
etc, there is no evidence of research oriented study on Materials Management in
cement industry in general and materials management in ACC Ltd, in particular.

1.12. NEED FOR THE STUDY AND STATEMENT OF THE PROBLEM:

The present Study intends to look analytically into the scenario of Materials
Management in general and to cement industry in particular. It is commonly
observed that the practice of materials management is not keeping pace with the
conceptual development in that area and this state of affairs is prevailing because
the major importance is being given to marketing and financial functions.
Although it is observed that potential benefit of applying scientific materials
management will go a long way in sustained progression of the industry, somehow
knee level interest on this function is evinced by the managers. Similarly,
management thinkers have also neglected the importance of materials
management in running an enterprise, but focused their attention on human
behavior, motivation and technology. Even while searching for excellence, the
recent management researches have failed to take cognizance of the pivotal role of
managing materials in the right way. The limited empirical research available on
materials management in Indian industries reveals that a very few comprehensive
studies have been made with reference to highly capital intensive industries like
steel, shipping etc. Although there is some literature available on cement industry relating to material pricing, material costing, pollution control etc, there is no evidence of research oriented study on Materials management in cement industry in general and materials management in ACC ltd, in particular.

The perceptions of employees, managers and other respondents directly and indirectly connected with materials management have to be collected and analyzed for bringing about an effective material management which will go a long way in reducing the cost of production and augmenting quality of product their by enhancing the comparative efficiency of the company. The present study is directed towards this end and hence acquires need and importance.

As mentioned earlier, the cement industry has registered a quantitative growth. But often questions are asked about the input scarcities normally confronted by the firms in cement industry with all the robust growth in demand. These include,
(a) Whether these cement manufacturing firms have achieved their output objectives for which they have been striving for? (b) Whether all the departments within are co-operating between each other? (c) What hurdles these departments face during production? (d) Whether the men and money are properly getting sufficient material? (e) What are the perceptions of the staff of ACC about the functioning of their firm? (f) How the executives manage supply chain? And (g) whether the policies of the firm towards material management are conducive? These and many more questions appeared before the researcher when he studied the literature pertaining to Cement Industry in general and ACC in particular. The present Study tries to find answers to some of the above questions taking a Case Study of ACC at Gulbarga district of Karnataka state. Thus the present study has been stated as “Materials Management in Cement Industry with special reference to Associated Cement Company in Gulbarga district”.

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1.13. OBJECTIVES OF THE STUDY:

The major objective of the present Study is to look into the Materials Management Mechanism in Cement Industry with special reference to ACC Ltd, wadi. However the specific objectives are:

1) To examine the present practice of Materials Management in ACC in the background of the concept of Materials Management.
2) To evaluate the importance of Materials Management in improving the profitability of ACC.
3) To analyze the supply pattern of various raw materials in ACC.
4) To identify the major problems of Materials Management in ACC.
5) To make concrete suggestions for improving the Materials Management system and practices in ACC, in the light of the findings of the study.

1.14. FORMATION AND TESTING OF HYPOTHESES:

With above objectives in view, the researcher formulated some hypotheses for the empirical verification. They are as follows.

Hypotheses - 1

Ho 1: Null Hypotheses

The Materials Management practices in ACC are contemporary.

Ha 1: Alternate Hypotheses

The Materials Management practices in ACC are not contemporary.

Hypotheses -2

Ho 2: Null Hypotheses

The complete implementation of Materials Management Principles alone will lead to profitability in ACC.
Ha 2: Alternate Hypotheses

The complete implementation of Materials Management Principles alone will not lead to profitability in ACC.

Hypotheses - 3
Ho 3: Null Hypotheses

The supply pattern of raw materials in ACC is perfect and standard.

Ha 3: Alternate Hypotheses

The supply pattern of raw materials in ACC is not perfect and standard.

Hypotheses - 4
Ho 4: Null Hypotheses

ACC is affected by the Problems of Materials Management.

Ha 4: Alternate Hypotheses

ACC is not affected by the Problems of Materials Management.

The above hypotheses have been tested and conclusions have been drawn with the help of data obtained from primary sources, using inferential & descriptive statistics. The details have been shown in the Chapter- V.

1.15. METHODOLOGY:

The present study is descriptive, analytical and explorative in nature and the design has been formulated as per the requirements of the study. The details of the methodology adopted by the Researcher are as under.

1.15.1. AREA OF STUDY:

The geographical location of the present study is limited to Gulbarga District in Karnataka where ACC plant is located. The Company has selected the location of plant keeping theories of location in mind. Gulbarga District is in the Northern belt of the Karnataka State comprising of very dry and rocky regions with a very
low rainfall. Further Gulbarga District is sharing boundaries with other states like Maharastra and Andra Pradesh. ACC plant located at Gulbarga is the focus of attention for the complete collection of the data and information.

1.15.2. SOURCES OF DATA:

The present Study, for its analysis, depends upon both primary and secondary data. In order to achieve the objectives of the study and to test the hypotheses set, the data were collected from both primary and secondary sources. Secondary data for the study were gathered from Annual Reports of the company, Journals, published statistical information from the various components of cement industry. The materials were also collected from District Statistical Office, Gulbarga, District Industrial Center, Gulbarga, Bureau of Industry and Commerce, Government of Karnataka, Bangalore; National Information Centre, Mumbai and Information and Library Network, Ahmedabad. The primary data were collected from the employees working in ACC cement works, Wadi, For the purpose of the study the employees were categorized into two divisions namely: 1. Workers of ACC and 2. Executives of ACC. The questionnaires were administered to the respondents to collect the data.

1.15.3. SAMPLE SIZE AND SAMPLE DESIGN:

The sample size and sample design for the Study is based upon the total number of workers and executives of ACC cement, Wadi. Although there are 2200 employees in ACC, Wadi, at present, it has 1600 permanent employees on the roll consisting of the workers and executives. The researcher has adopted stratified random sampling for administering questionnaires for the collection of primary data. To give proper representation to all departments and sections engaged in materials management function, the researcher selected samples from all such departments and sections. To procure contemporary and accurate information, the Questionnaires were served to 400 workers and 125 executives of ACC, wadi out
of the total permanent of 1600 permanent employees. The information provided by 300 workers and 100 Executive Officials was accurate and hence this remains as the foundation for the Study. The data was collected during the period from Oct-2011 to Dec-2011.

The following table provides the details of sample drawn for the study. For drawing samples to collect informations on materials management, the researcher classified the employees taking the basis of important activities of the wadi unit. The following table provides the details of the sample drawn for the study.

<table>
<thead>
<tr>
<th>Classification of employees (Activity-wise)</th>
<th>No of workers</th>
<th>No of Executives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>40</td>
<td>11</td>
</tr>
<tr>
<td>Production</td>
<td>75</td>
<td>26</td>
</tr>
<tr>
<td>Packing</td>
<td>40</td>
<td>15</td>
</tr>
<tr>
<td>Stores</td>
<td>20</td>
<td>08</td>
</tr>
<tr>
<td>Marketing</td>
<td>42</td>
<td>08</td>
</tr>
<tr>
<td>Accounts</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Transportation</td>
<td>42</td>
<td>12</td>
</tr>
<tr>
<td>Security</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>300</td>
<td>100</td>
</tr>
</tbody>
</table>

1.15.4. ANALYTICAL TECHNIQUES:

The data gathered through the schedules were edited and tabulated in order to make it amenable to analysis and interpretation. Editing consists of checking the
completed questionnaires for any errors and omissions, and correcting through consultation with the respondents wherever required. This was done in order to ensure accuracy in the information received. The data were then classified and tabulated. Tabulation is the arrangement of data into columns and rows so that further data analysis can be done. It was then analyzed to draw some information related to the problem under question. From the tabulated data percentage Tables were drawn to quantify the information so gathered. For simple presentation of the data, graphs were plotted for easy understanding of the data. Statistical tool such as SPSS (Statistical Package for Social Sciences') has been used apart from the manual method to get better and more accurate information about different aspects of the variables under Study. After analyzing in two stages inferences were drawn. The data gathered through the primary investigation were tabulated, presented in the form of appropriate Tables and analyzed. A few statistical tools like Likerts Scale, Graphs, Measures of Central Tendency, Histogram, z test and t test have been used to analyze the data.

1.16. SCOPE AND SIGNIFICANCE OF THE STUDY:

The aim of the present Study is to develop a standard system of materials management to all the industries in general and to cement industry in particular. The Researcher has selected ACC plant of Gulbarga district which is the major manufacturer of cement industry. The materials management in ACC, the present day practices in ACC, opinion of workers and executives in ACC will provide comprehensive information which should become a torch bearing for solving the problems of ACC in particular and cement industry in general. The Study assumes significance from the point of view of its practical utility in suggesting certain remedial measures in the form of policy recommendations aimed at improving the functioning of ACC. Besides, the Study throws light on the problems faced by the firms in the cement industry. Moreover, a fairly elaborative review of literature in the field brought to light that no comprehensive Study has been made on the
materials management in cement industry in the Study area in particular and elsewhere in general. Hence, the present Study is an attempt to fill up this research gap with particular reference to ACC in Gulbarga District of Karnataka State. The findings of this Study, it is hoped, would be quite useful for policy makers, planners, administrators, academicians, researchers and no doubt to the ACC too.

1.17. CHAPTER SCHEME:
The study has been presented in six chapters.

The first chapter is of introductory nature. It presents an introduction to materials management and cement industries. It also presents the summary of literature, need for the study hypotheses formulated, and the scope of study the methodology adopted for the study comprising methods of data collection, sample design, data analysis etc, and limited of the study.

The second chapter presents the conceptual and functional framework of materials management, comprising definition and meaning of materials management, its objectives, its scope and functions, integrated materials management and details regarding major activities of materials management.

In the third chapter, history of cements and growth and development of cement industries in the world, in Indian and in Karnataka have been presented.

In the fourth chapter, the profile of Gulbarga Districts and the profile of ACC Ltd, with special reference to ACC cement works, wadi, have been presented. This chapter focuses on details of Gulbarga district, growth and development of ACC Ltd, its organization structure and its performance.

The fifth chapter presents the analysis and interpretation of primary data collected from workers and executives of ACC cement works, wadi. This chapter also provides the details of testing of hypotheses and conditions drawn.

In the sixth and the concluding chapter, the summery of survey findings has been presented. Besides, in the light of finding of the study, suggestion have
been made for the improvement of materials management practices followed be ACC cement works, wadi, followed by formal conclusions.

1.18. LIMITATIONS OF THE STUDY:

Materials Management is a vast area of Study and it is a component of production and operations management. Hence the Study is confined to materials management in cement industry alone. The Study has not covered the materials management practiced in other industries like Iron and Steel, Cotton, Jute etc., to make the Study more specific, even other firms in the cement industry have not been taken except for passing references. The Study is developed on the post-facto appraisal design. Though sufficient time and care has been taken to collect the most reliable data by the Researcher, the memory bias on the part of respondents cannot be ruled out completely. Thus, the success of the Study requires the cooperation and the information given by the staff and executives of ACC. Many a time, they think that they gain nothing by such a Study and hence they do not provide accurate information. Time and finance are the other constraints limiting the horizon of the Study and the focus of Study is exclusively confined to ACC, Wadi, located in the Gulbarga district of Karnataka State.
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