
UNIT 1 MATERIALS FLOW SYSTEMS

Objectives

After reading this unit, you would be able to:

- Define materials management and describe its functions;
- Discuss the management of flow of materials;
- Appreciate the Materials logistics management (MLM) model; and
- Discuss the interfaces of materials management and describe a materials flow process.

Structure

- 1.1 Introduction
- 1.2 Materials Management and its Functions
- 1.3 Materials Management or Management of Flow of Materials
- 1.4 Materials Logistics Management (MLM)
- 1.5 Interfaces of Materials Management
- 1.6 Materials Flow Process
- 1.7 Summary
- 1.8 Self Assessment Questions
- 1.9 Reference and Suggested Further Readings

1.1 INTRODUCTION

Putting in the simplest terms materials management is about moving the materials within an organization. What do “materials” mean? Materials can basically be defined as those objects or things that are to be moved in order to produce goods. Material is one of the 5M’s that a manager has at his command, the other being Men, Machine, Methods and Money. Materials could be in the form of raw materials, paperwork, messages or information etc. So materials can be both tangible and intangible. You see the newspaper boy delivering the newspaper to your doorstep everyday or the milkman delivering the milk packets to you. These are tangible materials. There is also some material moved when you watch a movie on your television or when you receive a phone call. These are the intangible materials that are moved. So materials management is an important function of every business. The better is the materials management in a company the better is the health of that company.

1.2 MATERIALS MANAGEMENT AND ITS FUNCTIONS

Materials can be put in three categories. First category is purchased materials like the raw materials, components, spare parts and items that are used and do not appear in the end product. The second category is of in-process materials or the materials in the semi-finished stages and lastly the finished goods that are ready for customers. One has to manage these materials. The aim of this management is to obtain the materials at the minimum possible price while maintaining quality also and to maintain the inventories in such a way that minimum cost is incurred while maintaining adequate materials for the production process.

**Materials Management:
An Overview**

Let us see what materials management actually means. It is defined as a function that integrates purchasing, storage, inventory control, materials handling and standardization etc in an organization to achieve its objective of reducing the costs. Every organization wishes to maximize its profit by maximizing its production and minimizing the cost of production. The average material cost in a manufacturing setup is around 50-70% of the total expenditure, which further goes up if one takes into account the inventory costs, storage, waste and other factors etc. It is therefore imperative for an organization to have a sound materials management with an objective to reduce material costs, control inventories, ensure uniform flow of materials and maintain good relations with suppliers. Materials Management has to do activities related to planning, acquisition and utilization of materials.

Materials Management as a subject started picking up form early sixties and has gained importance thereafter. Since the amount of money incurred on materials is higher than the cumulative amount for machines, men and methods, one has to give high importance to the materials. It is the most feasible area that can offer opportunities for reduction of costs and improvement of profits. Materials add value to the product, as the product quality is directly dependent on the materials used. Materials Management thus can be seen as a system that assures the availability of products to the customers at minimum cost. In a nutshell, we can say that materials management is about making available the right materials in right quantity at a right price on the right time.

The functions of the materials management are materials planning and control, purchasing, inventory control, store keeping, material handling, warehousing, standardization & simplification and organization & appraisal of materials. This course has been designed in such a manner so that you get a feel of these functions in the subsequent blocks. Let us discuss them briefly.

- 1) **Materials planning and control:** Material requirement lies at the core of successful material management. This function is at the core of all the material requirements in any manufacturing process.
- 2) **Purchasing:** This function identifies the sources of supply, does market research, call tenders and select suppliers, negotiate with them and thus make available the raw materials.
- 3) **Inventory control:** This function is responsible for the location and storage of materials so that they remain available at the minimum cost and quickest time.
- 4) **Store keeping:** This function is responsible for the receipt and issue of the materials. The materials are stored in such a way that minimum handling is required and wastage is minimal.
- 5) **Material handling:** This function aims at minimizing handling and provision of equipments for handling materials. This function is crucial for minimizing space requirements, effective distribution and for providing better working space.
- 6) **Warehousing:** This function is responsible for the storage facilities for the materials, weighing facilities, materials handling equipments, material distribution facilities, fire fighting instruments etc.
- 7) **Standardization and simplification:** This function selects items of great demand and sets the standards for quality, raw material, sizes and performance of any product.

- 8) **Organization & appraisal of materials:** This function helps in effective functioning by proving smooth flow. It provides coordination and avoid delays and wastages

Management of materials embodies various costs. Since the ultimate aim of materials management is to reduce the costs of materials and hence the final product, it is worth seeing what these costs are. Let us take a glimpse of what these costs are:

Table 1.1: Costs involved in the Management of Materials

S.No.	Costs	Description
1	Cost of materials	The basic cost of materials that has to be paid to suppliers
2	Purchasing cost	The cost incurred in purchases e.g. cost on staff, tendering, stationary, postage, processing supplies, receiving, inspection
3	Inventory carrying costs	The cost incurred on storage including buildings, costs on staff, interest on capital locked/ borrowed, obsolescence
4	Packaging cost	Costs incurred on paper, plastic, metal foils, metal and wood containers etc.
5	Transportation cost	Costs incurred on moving the goods to different desired locations from time to time
6	Material handling cost	Costs incurred on handling equipments like cranes and conveyors
7	Wastage during production	Costs incurred on holding scrap, obsolete stock and their disposal

Source: Shah N.M. (1996), An Integrated Concept of Materials Management

An integrated materials management system helps in taking judicious decisions that in turn leads to lower cost for materials. Similarly if an organization has low inventory carrying costs, less stock outs etc., it is bound to do well.

1.3 MATERIALS MANAGEMENT OR MANAGEMENT OF FLOW OF MATERIALS

In any organization, the responsibility for maintaining the quality of the product and incurring less cost on its production is the responsibility of the production/ operation, deciding the price of the product and finding the customers that will buy it comes under marketing. The question arises that if it is so, what do the materials management function does? The answer is that from the time the materials enter the warehouse of the organization from the suppliers, the role of materials management starts and gets going till the final product is obtained. The interrelated activities that are carried out to achieve this are sequenced after each other in a systematic manner. Management of this flow of materials is called materials management. This flow of materials is met through a set of activities presented in Table 1.2 given below

Table 1.2: Set of activities for flow of materials

S.No.	Activity	Function
1	Planning	Setting the goals, indicating the sources of finance
2	Scheduling	Requirements specification, quantum and delivery schedules
3	Purchasing and Procurement	Vendor selection, vendor contracts
4	Inspection and Quality control	Conforming quality
5	Stores and Inventory control	Determining inventories, maintenance and upkeep
6	Materials handling and distribution logistics	Controlling flows, distribution, shipments

Source: Dutta A.K (1998), Materials Management: Procedures, Text and Cases

The table above highlights the importance of integrated systems and dependence of function models for decision-making. The organizations have now become multidimensional in nature. Total materials management concept evolved to address this dimension and avoid conflicting objectives. Total material management helps in establishing accountability so that response to a problem is quick and appropriate. The material functions are accomplished in more coordinated ways with the help of this integrated approach. When this happens there is increased communication for the need of materials and hence one gets lower costs, better inventory turnover, reduce stock outs and other significant benefits. Data processing systems are designed on the basis of the integrated material function.

In the subsequent units in this block you will study about the strategic role of materials management, and its relations with other functional areas.

1.4 MATERIALS LOGISTICS MANAGEMENT (MLM)

Materials logistics management program (MLM) started in eighties for an American university management students to meet the industry requirements. Bowersox et al. (1984) presented an overview of this philosophy.

Figure 1.1 shows the value-added activities included in MLM. There are two flows that are depicted here. One is a requirements information flow from customers to suppliers and other is a value-added materials flow from the suppliers to the customers. The whole process is directed by an integrated database. MLM covers three essential areas required for moving materials i.e. purchasing, manufacturing and physical distribution and asserts an integrated logic to ensure smooth flow of materials. As can be seen in the figure the MLM seeks the achievement of objective like controlled customer service performance, inventory reduction, minimum variance in planned operations, minimum total cost of operations and procurement and product quality control.

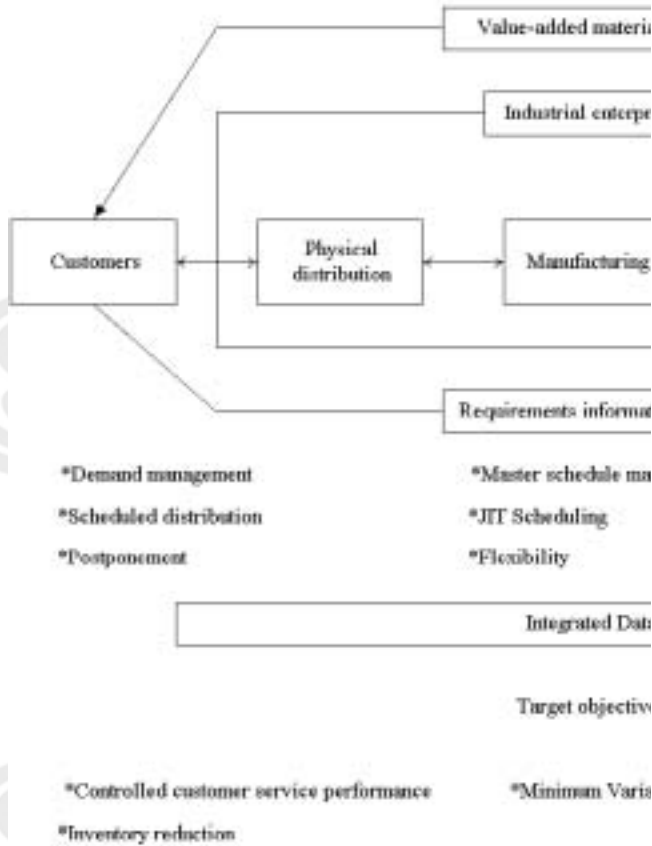


Figure 1.1: Materials Logistics Management Process

Source: Bowersox et al. (1984)

Bowersox et al. (1984) further described the three interfaces that MLM covers. These are the physical distribution interface, the manufacturing interface and the purchasing interface. Let us see how these interfaces contribute to the MLM productivity. The Table 1.3 summarizes this.

Table 1.3: The MLM productivity and various interfaces

Interface	Interfaces with	Perception 1	Perception 2	Perception 3
The Physical Distribution Interface	Customers and manufacturing	Demand Management	Scheduled distribution	Postponement
The Manufacturing Interface	Physical distribution and purchasing	Master schedule management	JIT scheduling	Flexibility
The Purchasing Interface	Manufacturing and external supplier network	Supply management	Schedule requirements	Responsiveness

Source: Based on Bowersox et al. (1984)

There are some perceptions attached with each interface.

From the point of view of the physical distribution interface,

- Demand management coordinates and modifies how customers order products in an effort to reduce uncertainty and simplify transactions,

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- Scheduled distribution aims to fulfill customer order in a short span of time and
- Postponement carries a planned delay of an activity as long as possible until a profitable preposition is achieved.

From the point of view of the manufacturing interface,

- Master schedule management resolves the conflicts between manufacturing and marketing as it is the point where overall requirements determined by forecasts, customers orders, back orders and physical distribution are collated.
- Just in time (JIT) scheduling or Kanban means bringing inventories to zero level. To reduce the inventory, methods like reducing lot sizes, load leveling, quality control and preventive maintenance can be used.
- Flexibility should be achieved by using “pull” systems, computer-based planning and control systems. Achieving flexibility is important to manufacturing as it will reduce manufacturing activities unless or otherwise specifically asked for.

From the point of view of the purchasing interface,

- Supply management identifies the manufacturing trends and initiates effective purchasing for long-term competitive advantage.
- Schedule requirements expedite purchasing. They must be specified so that suppliers provide exact lead-time information and purchasers provide exact requirement information to the supply network. This can be achieved by employing a suitable integrated data-processing system.
- Responsiveness of the supply network identifies frequent changes in customer requirements and product life cycles.

Bowersox et al. (1984) concluded with the following remarks, “increased uses of computer- based information systems will be required to achieve co-ordination and improved performance towards simultaneous attainment of target objective”.

Activity 1

Does the MLM stand validated in present business circumstances too? Comment

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1.5 INTERFACES OF MATERIALS MANAGEMENT

According to Dutta (1998), “When we say that materials management contains an integrated process of materials flow, in, through and out of an organization, we give some indication that materials management has interfaces of two kinds, internal and external”.

Let us see what these interfaces are

Table 1.4: Various Interfaces of Materials Management

S.No.	Interface	Description
1	Internal	Market forecasting Forecast demands to determine production on the basis of existing/ expanded facilities, equipment, processes, manpower and materials.
2		Production Materials flow begins before the production cycle, runs throughout and continues even after production, ensuring uninterrupted flow of materials to feed the production process.
3		Finance Materials budget is affected by non-availability of finance. A major chunk of finance is invested in materials and inventories.
4		Inventory control Materials management has a critical role here as availability of materials and access to physical supply has to be assured.
5		Inspection and quality control Close liaison with materials management is required as it also runs throughout like materials.
6		Materials Handling and physical distribution logistics Materials management ensures that materials are physically distributed at the right time with a minimum of handling.
7	External	Consumers/Customers Material management interfaces with customers rarely but it happens sometimes.
8		Suppliers/Other Companies Materials Management is responsible for keeping a close liaison with outside vendors and other companies seeking trade relationships. Evaluation of supplier performances should also be done.

Internal

External

Source: Based on Dutta A.K (1998), Materials Management: Procedures, Text and Cases

Materials management actually does not start with purchase of materials and end with production of materials. The total material management concept forces it to do much more. Dutta (1998) further stresses the materials management functions as follows:

**Materials Management:
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- 1) Materials forecasting, budgeting, planning and programming
- 2) Scheduling, purchasing and procurement
- 3) Receiving and receiving inspection as to quantity and quality
- 4) Inventory control, storage and warehousing
- 5) Materials handling, movement control and traffic etc.
- 6) Dispatch, shipping and disposal

In addition to this materials management also needs to put attention to coordinate all the above activities and keep liaison between manufacturing, finance and marketing etc. You will read about them in more details in unit 3 of this block.

Activity 1

Go the website of SAP and learn about its materials management module. What are the interfaces that it has?

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1.6 MATERIALS FLOW PROCESS

The aim of any organization is to manage its 5 M's as effectively as it can. These 5 M's as discussed earlier are Men, Machines, Money, Methods and Materials. The purpose of this coordination is production of superior goods at minimal costs. In this discussion, you have focused on the materials. If you have to exercise proper control over materials then you have to take care of your material flow as well as information flow. Dutta (1998) illustrated this process (Figure 1.2).

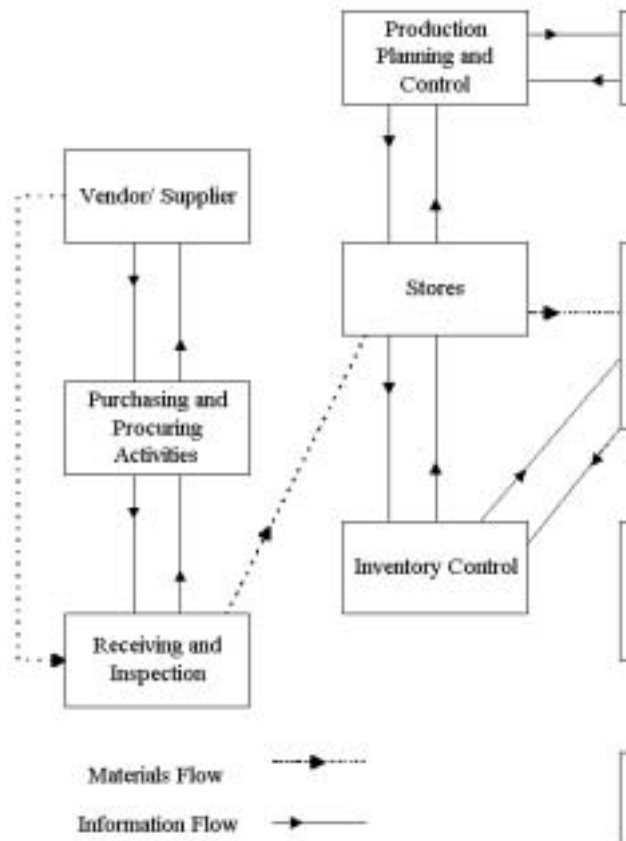


Figure 1.2: Illustration of materials flow process (internal flow-line and information flow)

Source: Dutta A.K (1998), Materials Management: Procedures, Text and Cases

As can be seen from the figure that there is a definitive flow of materials from vendor/supplier to the warehousing/customer and the organization is abounded in information flow. This is very important as materials and information both are extremely important and both should be readily available at a time when needed.

The materials flow is starting from the vendor/supplier from which material is to be purchased. Once the material is purchased it is received and inspected. After inspection stores accepts it. Production/ manufacturing and its subsystems call for the materials as and when it is required. Logistics takes control after that. Warehousing and customer comes after that.

The information flow is everywhere. As you can see, information flow embodies much more than the materials flow. Be it production planning and control or sales and marketing, inventory control or purchasing and procurement activities. The effectiveness of the materials flow is thus dependent on decision-information. If an organization can control these two flows easily and effectively then it will definitely render goods products at a low cost and also would be able to offer good service.

1.7 SUMMARY

According to Noble et al. (1998), the complexity of the integrated material flow system design problem is not trivial. The following is a partial listing of the factors that need to be considered:

- *Facility layout* - building, departments, cells, aisles, P/D stations,
- *Material handling* - equipment, unit load, flow path, P/D interface, routing, loading,

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- *Scheduling* - sequence, dispatching, priority, availability, due dates, processing/transport times, flexibility,
- *Materials* - handling characteristics, form, density, volatility, size, liquid, solid, fragile, bulk/unit,
- *Processes* - size, capacity, reliability, processing time, setup time, batch size, input/output queue size, quality,
- *Product* - size, quantity, variation, perishability, fragility,
- *Inventory* - policy, space requirements, location/layout, storage type/method, control.

This unit is summarized with a view to the above discussion. Materials management is an important function of every business. The better is the materials management in a company the better is the health of that company. The functions of the materials management are materials planning and control, purchasing, inventory control, store keeping, material handling, warehousing, standardization & simplification and organization & appraisal of materials. Management of this flow of materials is called materials management. This flow of materials is met through a set of activities that you have learnt in this unit. You have learnt about Materials logistics management program (MLM) started in eighties for American university management students to meet the industry requirements. You have also discussed about the materials management's interfaces, both internal and external. Materials flow and information flows are also discussed and their importance highlighted. This would give you adequate insight on what material management is all about and how the material moves. You will further learn about the factors that have been highlighted by Noble (1998) as you move on to the other blocks in this course.

1.8 SELF ASSESSMENT QUESTIONS

- 1) Define materials management. What are the categories in which materials can be put? Discuss the functions of the materials management in detail.
- 2) If the responsibility for maintaining the quality of the product and incurring less cost on its production is the responsibility of the "production/ operation" and deciding the price of the product and finding the customers that will buy it comes under "marketing". What do the "materials management function" does?
- 3) Discuss the value-added activities included in Materials logistics management program (MLM). Describe the three interfaces that MLM covers.
- 4) "Materials management contains an integrated process of materials flow, in, through and out of an organization". Comment on it and talk about the reasons behind it.
- 5) Materials flow and information flows are equally important in the materials flow process. Why?

1.9 REFERENCE AND SUGGESTED FURTHER READINGS

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