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Senior Secondary Course

# Transportation & Warehouse Management

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# A Word With You

Dear Learners,

I welcome you to this course in Transportation and Warehouse Management at the Senior Secondary level. We all know the importance of Transportation and Warehouse procedures and practices in our everyday life. Transportation and Warehouse in the past are completely different from modern days. Therefore, a systematic effort is required to understand, analyze and respond to the changes that affect Transportation and Warehouse functioning in the present day society.

Transport Management is the study of the processes and systems used to safely deliver passengers and goods from one location to another. Transport Management also examines the major environmental, operational, and economic problems affecting the transport and distribution industries. Transport Management seeks to answer questions like: How to create transport systems and infrastructure that are safe and reliable for both cargo and workers? Transport and Warehouse Management learners typically work in national and international trading and commerce, in passenger transport companies on the road, rail, air or sea. Some clients prefer outsourcing logistics to experts, so transportation managers can also practice in special consultancy firms.

Through this course, you will gain a comprehansive understanding of the orchestration of logistics/transportation. The big picture of logistics and transportation keeping in mind the above, the curriculum of Transportation and Warehouse Management at Senior Secondary level has been designed. The layout of teh pages has been designed to make your learning process interesting and useful. You will also find some attractive icons in the lesson symbolizing the content of different sections. Some sections like Do and Learn, Key Terms, Role Play etc.

Keeping in mind the above, the curriculum for Transportation and Warehouse Management at Senior Secondary level has been designed. The whole learning material of the subject has been published in two books for your convenience. The book has five modules and 26 chapters.

I am sure that you will find the lessons and their approach interesting and can apply your knowledge in real life situations. So read all the lessons of this course carefully and be prepared for the examination with confidence. If you face any difficulty with your studies, please write to me. Your suggestions are valuable to us.

Good luck and happy learning.

Course Coordinator

# How to use the Study Material

Congratulations! You have accepted the challenge to be a self-learner. It means, you have to organize your study, learn regularly, keep up your motivation and achieve your goal. Here it is solely you, who is responsible for your learning. NIOS is with you at every step. It has developed the material in Transportation and Warehouse Management keeping only you in mind. A format supporting independent learning has been followed. You can take the best out of this material if you follow the instructions given below.

**Title:** The title of the lesson will give a clear indication of the contents within. Do read it.

**Introduction:** This will introduce you to the lesson and also link it to the previous one.

**Objectives:** These are statements of outcomes of learning expected from you after studying the lesson. You are expected to achieve them. Do read them and check if you have achieved the same.

**Content:** Total content has been divided into sections and sub-sections. A section leads you from one content element to another and a sub-section helps you in comprehension of the concepts in the content element. The text in bold, Italics or boxes is important and must be given attention.

**Intext Questions:** Objective types self-check questions are asked after every section, the answers to which are given at the end of the lesson. These will help you to check your progress. Do solve them. Successful completion will allow you to decide whether to proceed further or go back and learn the unit again.

**Notes:** Each page carries empty space on the outer margins for you to write important points or make notes.

**What You Have Learnt:** It is the summary of the main points of the lesson. It will help in recapitulation and revision. You are welcome to add your own points to it also.

**Terminal Questions:** These are questions answered that provide you an opportunity to practice for better understanding of the whole topic.

**Answers to Intext Questions:** These will help you to know how correctly you have answered the Intext questions.

**Activity:** Activities, if done by you, will help you to understand the concept clearly.

**Key Terms:** The important terms used in the lesson are highlighted in this section. Do remember these terms.

**Do and Learn:** In this section certain activities have been suggested for better understanding of the concept.

**Role Play:** To make your learning interesting an imaginary situation is given based on any concept covered in the lesson. You are required to enact the imaginary situation through realistic behavior. You are free to choose any other concept/topic of your choice to play the role.

**QR Code:** A quick response (QR) code is given in every lesson which is a type of barcode that stores information and can be read by a digital device, such as a cell phone.

**Audio:** For understanding difficult or abstract concepts, audio programmes are available on certain content areas. You may listen to these on Mukt Vidya Vani, Community Radio FM-91.2 or on YouTube channel “niosradiovahini”.

**Video:** Video programmes on certain elements related to your subject have been made to clarify certain concepts.

You may watch these at NIOS live YouTube channel and also see live programs on PM e-vidya.

# Course Overview

### Module 1: Transportation-1

1. India's Road Network
2. Highways in India
3. Institutional Framework of Infrastructure Development
4. Structural Framework of NHAI -PPP Model
5. Railways in Indian Logistics
6. Features of Freight & Passenger Movement


### Module 2: Transportation-2

7. Inland Waterways
8. Indian Inland Waterways
9. Modes of Air Transportation
10. Trends in Logistics Industry
11. Multimodal Transportation
12. Air Transportation

### Module 3: Introduction to Warehouse

13. Warehouse: Meaning, Definition and Objectives
14. Need for Scientific Warehouses
15. Types of Warehouses
16. Warehouse Organisation Structure - Roles and Responsibilities


### Module 4: Warehouse Management

17. Warehouse Utilization Management
18. Inventory Management of a Warehouse
19. Operations and Handling of a Warehouse
20. Need for Physical Distribution in Warehouse
21. Channels of Distribution

### Module 5: Warehouse Activities and Warehouse Documentation

22. Warehouse Activities
23. Cross Docking Method
24. Warehouse Handling Equipment
25. Methods of various Material Handling Systems in Warehouse
26. Technology for Warehouse Management

# Contents



**Note:** The details of the different sections are on the next page.

# Bifurcation of Syllabus in
# Warehouse Principles & Inventory Management
# Secondary Level

| Total no. of Lessons=26 | | | |
|---|---|---|---|
| **MODULE (No. & name)** | **TMA (40%) (A)** | **Public Examination (60%) (B)** | |
| | **(No. of lessons -10)** | **SUBJECTIVE 50 % (I)(No. of lessons -08)** | **OBJECTIVE 50 % (II)(No. of lessons -08)** |
| **Module- 1**: Transportation-1 | **L-2:** Highways in India<br>**L-4:** Structural Framework of NHAI -PPP Model | **L-1:** India's Road Network<br>**L-5:** Railways in Indian Logistics | **L-3:** Institutional Framework of Infrastructure Development<br>**L-6:** Features of Freight & Passenger Movement |
| **Module- 2**: Transportation-1 | **L-8:** Indian Inland Waterways<br>**L-9:** Modes of Air Transportation | **L-7:** Inland Waterways<br>**L-11:** Multimodal Transportation | **L-10:** Trends in Logistics Industry<br>**L-12:** Air Transportation |
| **Module -3:** Introduction to Warehouse | **L-15:** Types of Warehouses<br>**L-16:** Warehouse Organisation Structure - Roles and Responsibilities | **L-13:** Warehouse: Meaning, Definition and Objectives | **L-14:** Need for Scientific Warehouses |
| **Module – 4:** Warehouse Management | **L-19:** Operations and Handling of a Warehouse<br>**L-21:** Channels of Distribution | **L-17:** Warehouse Utilization Management<br>**L-20:** Need for Physical Distribution in Warehouse | **L-18:** Inventory Management of a Warehouse |
| **Module – 5:** Warehouse activities and Warehouse documentation | **L-22:** Warehouse Activities<br>**L-26:** Technology for Warehouse Management | **L-25:** Methods of various Material Handling Systems in Warehouse | **L-23:** Cross Docking Method<br>**L-24:** Warehouse Handling Equipment |

**Note:** The syllabus has been bifurcated into two sections –

I. (i) Lessons for the Tutor Marked Assignment(TMA)

II. (ii) Lessons for public examination question paper

Lessons in Section (ii) are further divided as-

(A) Lessons for objective type Questions only

(B) Lessons for subjective type of questions.

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# WAREHOUSE: MEANING, DEFINITION AND OBJECTIVES

A convenient place is selected to store all this in front of us, a place we call a warehouse. The Warehouse is a place for everything and everything in its place is a basic principle of warehousing. The All India Rural Credit Survey appointed by the Reserve Bank of India in 1954 set the tone for setting licensed warehouses in India. A warehouse is governed by various laws regarding operational and local compliances of warehouses, laws defining rights and obligations of warehousemen, laws concerning quality, safety, and security of goods stored, laws concerning warehouse receipts, etc.

## LEARNING OUTCOMES

After studying this lesson the learner:

- discusses basic concepts of warehousing;
- explains historical perspective of warehousing in India;
- identifies growth and development of warehousing;
- compares various laws associated with warehousing set up.

## 13.1 WAREHOUSE: A NEW ENTITY

Warehouse is a structure or room for the storage of merchandise or commodities. Even if we break the name warehouse into "ware" and "house" it represents, a house for ware (tradable) goods that means a place where marketable or merchandise goods are stored.

Warehouse is a commercial building used by commercial entities like manufacturers, traders, importers, farmers to store raw materials, finished goods etc. till they are

reshipped for sale or consumption. Warehouse is therefore a planned space for efficient storage and handling of goods and materials.

### 13.1.1 What Is Warehousing

Warehousing is the act or process of storing large quantities of goods in a "storage place" specifically known as a warehouse so that they can be sold or used at a later date. Warehousing has been defined by *Robert Hughes* as a set of activities that are involved in receiving and storing of goods and preparing them for reshipment.


***Fig. 13.1 (a) :*** **Importance of Werehousing**

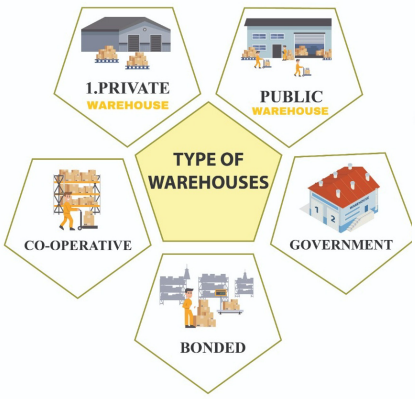



***Fig. 13.1(b):*** **Type of Werehousing**

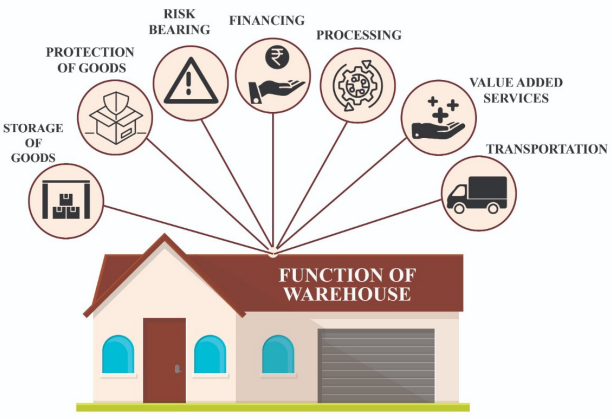



***Fig. 13.2 (c):*** **Function of Werehousing**

Traditionally warehousing deals with storage of goods until they are needed for production, consumption and distribution of various types of goods. It is therefore considered as an



important link between production and consumption of various goods. Generally, storage and warehousing are used interchangeably, as warehousing also involves storage but the term warehousing is different from storage. Anyone can undertake storage of his own goods but warehousing always involves storage of stocks owned by other persons, called "Depositors". The person undertaking storage is called the "Warehouseman". As per the definition of the State Warehousing Corporation Act, 'Warehouseman means a person who has obtained a licence under this Act for the purpose of carrying on his business of warehousing'.

Warehousing not only provides adequate storage facilities but facilitates different functions like receipt of goods, their identification, assembly, delivery, transportation etc., so as to ensure availability of goods at all times to all concerned persons to meet their demand.

### 13.1.2 Why Warehousing

It is a well-planned economic activity -

- To ensure safe storage of different commodities.
- To maintain the quality of goods.
- To ensure uninterrupted supply of goods through all seasons
- To fulfill the obligation towards delivery of quality products at all times to all customers.

## 13.2 TRACE ORIGIN OF WAREHOUSING

Warehousing has played a key role in human history even from the early days of civilization to preserve food due to the unpredictability of food at all times availability. The earliest examples of such facilities included storage pits to store surplus food and seeds. This implies that even during ancient times, the human civilization of the Indus Valley had the vision to adopt warehousing practices for an uninterrupted supply of food materials during the "rainy days". The granaries of Jordan valley date back as far as 9500 B.C. The available evidence indicates that the storage of food grains started in the Mesolithic period i.e. 8000 B.C. During the 19th century, a number of warehouses were set up on the banks of the Thames River in England to provide proper security and distribution of goods. This concept leads to the growth of warehousing as a milestone of economic development. Big SARAIs apart from accommodation also provided space for the storage of merchandise goods. Today providing food to one and all has become a global priority, thereby necessitating improvisation and growth of warehousing all over the world. ***Warehousing can be described as an important activity of survival, of the people, by the people, for the people at all times.***

## INTEXT QUESTIONS 13.1

1. The act or process of storing large quantities of goods so that they can be sold or used at a later date is generally referred to as a,

   a. Inventory management  b. Marketing

   c. Warehousing  d. None of the above.

2. Warehousing is an economic activity because it helps to

   a. Ensure safe storage of different commodities.

   b. Maintain the quality of goods.

   c. Ensure uninterrupted supply of goods through all seasons

   d. All of the above

3. During Maurya period in India, warehouses were set up to tide over_____.

4. What is the difference between warehouse and warehousing?

## 13.3 HERITAGE OF WAREHOUSING IN INDIA

The recommendations of the Famine Commissions led to many institutional developments with a focus on agriculture, rural credit, and warehousing. The establishment of licensed warehouses in India was first recommended by the Royal Commission on Agriculture in 1928. The importance of warehousing was felt seriously in India and the Reserve Bank, in the year 1944, urged all the State Governments by issuing directions to enact legislation for setting up warehouses in their concerned States. Gadgil to report on the ways in which rural indebtedness could be reduced in light of the recommendations of the Policy Committee on Agriculture, Forestry and Fisheries, 1945. In relation to the promotion of warehousing, the committee observed that the lack of proper facilities for the storage and warehousing of agricultural produce had been a serious obstacle in the way of increasing the scale of advances against agricultural produce by cooperative marketing societies or commercial banks. The Committee pointed out that the lack of proper storage and warehousing facilities is a factor responsible for the poor scale of credit advances. The Committee recommended that Provincial Governments should consider the desirability of advancing long-term loans at concessional rates of interest to cooperative societies to build godowns at important market centers. The Committee recommended setting up a Warehousing Development Board with funds contributed by the Central Government, the Reserve Bank of India, and

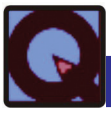


the provincial Governments. This Board was to be entrusted with the responsibility of promoting the construction of scientific warehouses in the country with the financial support of commercial banks and cooperative institutions.

a. Establishment of a "National Board" to be called "the National Cooperative Development & Warehousing Board". The board had to plan and finance the scheme and be in charge of the function of storage and warehousing. Board will also be responsible for the distribution of basic requirements of the producer and consumer.

b. Establishment of an all-India Warehousing Corporation with the investment in the share capital by Central Government and various institutions, and establishment of State Warehousing Companies having the State Governments and the All-India Corporation as participants.

c. Co-operative Societies at the ground level.



## INTEXT QUESTIONS 13.2

1. Fill in the blanks-

   a. The establishment of licensed warehouses in India was first recommended in 1928 by the _____.

   b. In 1954, an All India Rural Credit Survey Committee under the chairmanship of Sh. Gorwala was appointed by _____

   c. The Government of India appointed a Sub-Committee under the chairmanship of late Prof. D. R. Gadgil to_____

## 13.4 STRUCTURAL FORMAT OF WAREHOUSES IN INDIA

Based on the recommendation of the All India Rural Credit Survey Committee, the Agricultural Produce (Development and Warehousing) Corporations Act, 1956, was enacted by the Parliament. The markets of all India importance were to be served by the Central Warehousing Corporation (CWC); secondary markets of district-level importance were to be served by State Warehousing Corporations (SWC) and the warehousing needs at the village and community level were to be looked after by Cooperatives. The Act also provided that the share capital of CWC was to be subscribed by the National Co-operative (Development and Warehousing) Board and other institutions like the Banks, Co-operative Societies, Insurance Companies, etc. There was no provision in the Act enabling the Corporation to take up the storage of commodities other than

agricultural produce, inputs, and implements. The share capital of the SWCs was to be subscribed by the Central Warehousing Corporation and the concerned State Government in equal proportion. Thus, both the Central Warehousing Corporation and the State Governments were to be equal owners of the State Warehousing Corporations. In 1962, the Government of India decided to break up the Agricultural Produce (Development and Warehousing) Corporations Act, 1956 into two Acts, namely National Cooperative Development Corporation Act, 1962 and the Warehousing Corporations Act, 1962. The Act defines specific functions and areas of operation of Central and State Warehousing Corporations. The CWC in coordination with SWCs has been assigned to operate at the places of national importance and state importance.

### 13.4.1 Functions of Central Warehousing Corporation

The functions of Central Warehousing Corporation as defined under section 11 of the act and notifications issued there under are:-

- Acquire and build godowns and warehouses at suitable places in India as it thinks fit.
- Run warehouses for the storage of agricultural produce, seeds, manures, fertilisers, agricultural implements and notified commodities offered by individuals, co-operative societies and other institutions.
- Arrange facilities for the transport of agricultural produce, seeds, manures, fertilisers, agricultural implements and notified commodities to and from warehouses.
- Subscribe to the share capital of a State Warehousing Corporation.
- Act as agent of the Government for the purposes of purchase, sale, storage and distribution of agricultural produce, seeds, manures, fertilisers, agricultural implements and notified commodities.
- Carry out such other functions as may be prescribed.

Initially the private sector was shy of entering into the warehousing business which was considered to be a highly capital intensive industry. It was a monopoly business for the Central and State Warehousing Corporation on which the government and the banking sector had a greater trust. This situation continued till 1995, where after, economic liberalisation, and various policies and schemes of the Government supporting construction of warehouses helped in increasing penetration of private players. The massive growth in private warehousing capacity led the Government to develop regulatory processes for a credible warehousing ecosystem in the country.

## INTEXT QUESTIONS 13.3

1. In 1962, Agricultural Produce (Development and Warehousing) Corporations Act, 1956 was bifurcated into two Acts, namely National Cooperative Development Corporation Act, 1962 and the _____.

2. Food Corporation of India was made under_____act_____

## 13.5 AIMS, OBJECTIVES

Within a company's supply chain, warehousing logistics encompasses activities related to the **correct storage, protection and conservation of** goods in an installation for the period of time required. It also involves the **management, transportation, location, handling and conditioning** of this merchandise from receipt to dispatch.

The warehouse is the key element that enables you to regulate the flow of goods between supply and demand. It is here that the **management of the materials that a business moves, stores and handles** is concentrated to respond to commercial and production needs. Installations, thus, are the cornerstone of warehouse logistics.

The **objectives of warehousing** are also known as the **importance of warehousing** and the points are:-

### 1. Primary Objectives

**A. Deployment of marketable goods:** The primary objective or goal of warehousing is to meet the diverse needs of a company's marketing function. Any company is not so famous that it has an advance order to supply. Moreover, production and supply have a significant time difference. Warehouses are considered to be holding finished goods for future delivery.

**B. To meet consumption requirement:** In general, companies don't produce according to market needs. Once the product is manufactured it is stored in order to maintain the economies of production, the availability of labour, raw material, and fashion in the market.

### 2. Secondary Objectives

**A. Speculative purpose:** Some traders used warehouses to dump goods and create artificial scarcity of the item on the market in order to demonstrate the importance of warehousing. Scarcity increases prices in the market, and traders profit by selling them at increased prices.

**B. As production against anticipated supply:** Sometimes, goods are kept in warehouses to cater to anticipated demand in the future. Through this factor, the prices of products can also be affected. And Salient Features of Warehousing (Development and Regulation) Act, 2007.

The main objectives of the Warehousing (Development and Regulation) Act of 2007 are to make provisions for the development and regulation of warehouses, negotiability of warehouse receipts, the establishment of a Warehousing Development and Regulatory Authority (WDRA) and related matters. Section 3 of the Act prescribes the requirement of registration of a warehouse for issuing negotiable warehouse receipts as under: Further provided that no such registration shall be required for warehouses which do not propose to issue a negotiable warehouse receipt. The Warehousing Development and Regulatory Authority (WDRA) set up under the Act has so far notified 123 agriculture and 26 horticulture commodities for issue of negotiable warehouse receipts (NWRs) including cereals, pulses, oil seeds, spices, rubber, tobacco and coffee.

## INTEXT QUESTIONS 13.4

1. What are the objectives of Warehousing?

2. When the provisions of Warehousing (Development and Regulation) Act, 2007 were made effective

   a). 25th Oct. 2010. b). 25th Sep. 2010.

   c). 25th Nov. 2010. d). None of these

## 13.6 IMPORTANT LAWS CONCERNING WAREHOUSES

State Warehouses Acts & Rules are one of the oldest Acts regulating warehousing in the country. A license is required under the State Warehouse Act to carry out warehousing business in the State concerned. It is obligatory for any person carrying on the business of warehousing to run his warehouse according to the terms and conditions of the license granted for the purpose and the commodities listed in the Schedule of the Act. The State Warehouse Act and Rules also outline the obligation and duties of warehousemen and depositors.

### 13.6.1 Laws Governing Operational and Local Compliances of Warehouses

**A. The Customs Act, 1962**

Chapter IX of this Act (Section 57-73) deals with warehousing to bonded warehouses.



It sets the procedure for appointing public warehouses, licensing private warehouses and provisions of a warehousing bond to be executed by an importer of the goods.

### B. Central Excise Act, 1944

Section 37, sub section (1) (viii) of the Act provides for the powers of the central government to make rules to provide for the appointment, licensing, management and supervision of bonded warehouses and the procedure to be followed in entering goods into and clearing goods from such warehouses.

Chapter VII of the Central Excise Rules 1944 provides for the procedure for operation of excise bonded warehouses, while Chapter VIIA deals with licensing of warehouses.

### C. The Shops and Establishments Act of respective State Governments

However, as per the Act, all shops and commercial establishments operating within each state are covered by the respective Shop & Establishments Act. The Shop and Establishment Act is regulated by the Department of Labour and regulates premises wherein any trade, business or profession is carried out.

### D. The Insecticides Act, 1968

It is an Act to regulate the import, manufacture, sale, transport, distribution and use of insecticides to prevent risks to human beings or animals, and for matters connected therewith. Since the agri. warehouses use a substantial quantity of pesticides for the preservation of stored agri. commodities, they have the obligation to comply with the provisions under this Act. The warehouses have to make judicious use of pesticides to keep the stored goods free from pesticide residues and keep them safe and also be compliant with various provisions of the Act.

### E. The Fertiliser (Control) Order, 1985

The FCO provides for compulsory registration of fertiliser manufacturers, importers, and dealers, specification of all fertilisers manufactured/imported and sold in the country, regulation on the manufacture of fertiliser mixtures, packing and marking on the fertiliser bags, the appointment of enforcement agencies, setting up of quality control laboratories and the prohibition on manufacture/import and sale of non-standard/spurious/adulterated fertilisers. The order also provides for the cancellation of the authorization letter/registration certificates of dealers and mixture manufacturers and imprisonment from 3 months to 7 years with a fine to offenders under the Essential Commodities Act.

### F. The Legal Metrology Act, 2009

The Legal Metrology Act, 2009 (Act 1 of 2010) repeals and replaces the Standard of Weights and Measures Act, 1976 and the Standards of Weights and Measures

(Enforcement) Act, 1985. Section 24 (1) of the Act provides that every person having any weight or measure in his possession, custody or control in circumstances indicating that such weight or measure is being or is intended or is likely to be, used by him in any transaction or for protection, shall, before putting such weight or measure into such use, have such weight or measure verified at such place and during such hours as the Controller may, by general or special order, specify on this behalf, on payment of such fees as may be prescribed. Since warehouses use different types of weighing scales, they must keep all their weighing scales stamped timely.

### 13.6.2 Law Defining Rights and Obligations of Warehousemen

#### A. The Indian Contract Act, 1872

A warehouseman is a bailer, who in the ordinary course of business enters into a contract for the storage of goods belonging to a depositor. Chapter IX of the Indian Contract Act, 1872 covers in detail the concept of bailment. It defines that a "bailment" is the delivery of goods by one person to another for some purpose, upon a contract that they shall, when the purpose is accomplished, be returned or otherwise disposed of according to the directions of the person delivering them. The person delivering the goods is called the "bailer". The person to whom they are delivered is called the "bailey".

### 13.6.3 Laws Concerning Quality, Safety and Security of Goods Stored

#### A. Agricultural Produce (Grading and Marking) Act, 1937

The Directorate of Marketing and Inspection, Ministry of Agriculture and Farmers Welfare enforces this Act. Under the Act, Grade standards are prescribed for agricultural and allied commodities. The rules shall include determining grade designation to point out the quality of any article described under the Schedule, characterising the quality of the product specified under the grade designation, denoting grade designation marks to symbolise specific grade designation and empowering a person or group of persons to provide grade designation mark to any product with regard to which the mark is set down or any covering included with or label fastened in any product.

#### B. The Food Safety and Standards Act, 2006

It is an Act to consolidate the laws relating to food and to establish the Food Safety and Standards Authority of India for laying down science-based standards for articles of food and regulate their manufacture, storage, distribution, sale, and import, to ensure the availability of safe and wholesome food for human consumption and matters connected therewith or incidental thereto. It is a statutory body for prescribing science-based standards for articles of food regulating, manufacturing, processing, distribution, sale, and import of food to ensure safe and wholesome food for human consumption.



### C. National Food Security Act, 2013

National Food Security Act 2013 under the heading public distribution system, the section 22 and 24 of the Act, directs central and state government to create and maintain required modern and scientific storage facilities at different levels including State, District and Block levels, being sufficient to accommodate food grains required under the Targeted Public Distribution System and other food-based welfare schemes This is an Act to ensure food security to enable assured economic and social access to adequate food and life with dignity, for all persons in the country, at all times, in pursuance of their fundamental right to live with dignity.

## 13.6.4 Law Concerning Warehouse Receipts

### A. The Sale of Goods Act, 1930

Negotiable Warehouse Receipts are regarded as a document of title to have its negotiability established. It was only covered under the Sale of Goods Act, 1930, Section 2 (4) which defines a document of title to goods as under "document of title to goods includes a bill of lading, dock warrant, warehouse keeper's certificate, wharfinger's certificate, railway receipt, warrant or the order for delivery of goods and any other document used in the ordinary course of business as proof of possession or control of goods, or authorising or purporting to authorise, either by endorsement or by delivery the possession of the document to transfer or receive goods thereby represented". Negotiable Warehouse Receipts were considered as a form of warehouse keeper's certificate.

## 13.6.5 The Law Regulating the Depositors, Consumers and Manpower

### A. The Essential Commodities Act, 1955

Under the Essential Commodities Act, the state government issues dealer licensing orders, which require a person to obtain a license before buying or storing specific commodities. While the licensing government also specifies stock limits for commodities declared as essential commodities. Such orders of the government act as an impediment to the promotion of the warehousing business. Under such situations, trading of warehouse receipts becomes limited, as only licensed holders can buy and sell such warehouse receipts.

### B. The Consumer Protection Act, 1986

This Act protects consumers against any deficiency in the supply of goods and services by an entity. Warehousing, being a Service industry, falls under the ambit of this Act. Deficiency is described as a fault, imperfection, shortcoming or inadequacy in quality,

standard and manner of performance which is required to be maintained by or under any law for the time being in force. Though the Act is consumer-centric, there is provision for rejection of frivolous complaints. It says that where a complaint instituted before the District Forum, the State Commission or the National Commission, is found to be frivolous or vexatious, it shall, for reasons to be recorded in writing, dismiss the complaint and make an order that the complainant shall pay to the opposite party such cost, not exceeding ten thousand rupees, as may be specified in the order.

### C. The Industrial Dispute Act, 1947

Since a warehouse employs both regular employees and outsourced contractual employment, it falls under the provisions of this Act

### D. Essential Services and Maintenance Act, 1981

It is An Act to provide for the maintenance of certain essential services and the normal life of the community. Storage and distribution have been defined as essential services under section 2. (1) (a) of the Act . It gives powers to the central government to prohibit strikes in any of the essential services and impose a penalty for any violation.

### E. Contract Labour (Regulation & Abolition) Act, 1970

Since warehouses employ a large number of contract labour for various operational purposes, it falls under the ambit of this Act. The objective of the Act is to prevent the exploitation of contract labour and also to introduce better conditions of work. A workman is deemed to be employed as Contract Labour when he is hired in connection with the work of an establishment by or through a Contractor. Contract Labour differs from Direct Labour in terms of the employment relationship with the establishment and method of wage payment. The warehouse operator becomes the Principal Employer who has to apply for registration in respect of each establishment.

## INTEXT QUESTIONS 13.5

1. Can any warehouse issue NWR without registration with WDRA.
2. The Food Safety and Standards Act, 2006 has been made after replacing 8 old laws.
3. National food security act 2013 was enacted to ensure _____, for all persons in the country, at all times, in pursuance of their fundamental right to live with dignity.

4. The warehouseman as a bailey is described in the,

   a). Essential Commodities Act, 1955 b). Indian Contract Act, 1872

   c. Sale of Goods Act, 1930 d). None of the above.

## WHAT YOU HAVE LEARNT

Warehouse is a planned space for efficient storage and handling of goods

The action and process of storing goods in warehouse is known as warehousing. A license is required under the State Warehouse Act to carry out warehousing business in the State concerned.

All India Rural Credit Survey Committee appointed by the Reserve Bank of India in 1954 set the tone for establishing warehousing in India.

Warehouse ensures safe storage and maintains quality of different commodities

**LAWS GOVERNING OPERATIONAL AND LOCAL COMPLIANCES OF WAREHOUSES**

- The Customs Act, 1962
- Central Excise Act, 1944
- The Shops and Establishments Act of respective State Governments
- The Insecticides Act, 1968
- The Fertilizer (Control) Order, 1985

**LAWS CONCERNING QUALITY, SAFETY AND SECURITY OF GOODS STORED**

- Agricultural Produce (Grading and Marking) Act, 1937
- The Food Safety and Standards Act, 2006
- National Food Security Act, 201364

**OTHER RELEVANT LAWS**

- The Indian Contract Act, 1872 .
- The sale of Goods Act, 1930.
- The Essential Commodities Act, 1955
- The Consumer Protection Act, 1986
- The Industrial Dispute Act, 1947
- Essential Services and Maintenance Act, 1981
- Contract Labour (Regulation & Abolition) Act, 1970

## KEY TERMS

| | | |
|---|---|---|
| Warehouse | Warehousing | Safe storage |
| Grain quality | Central Warehousing Corporation | |
| Negotiability, | Bailey | |

## TERMINAL EXERCISE

1. Do we require a license to carry out warehousing business in the State concerned?
2. Why was the private sector shy of entering into the warehousing business in the initial years?
3. Agricultural Produce (Development and Warehousing) Corporations Act, was enacted in which year?
4. Who first recommended the establishment of licensed warehouses in India?
5. The Warehousing Corporations Act was made in which year?
6. What were the recommendations of the Rural Credit Survey Committee (1954)?
7. List important functions of Central Warehousing Corporation.
8. What you understand from the Legal Metrology Act, 2009.
9. Please write a short note on the salient features of the Sale of Goods Act, 1930.
10. What is the role of the Central Goods and Services Tax Act, 2017.
11. Mention briefly about the National Food Security Act, 2013.
12. How do you differentiate between warehouse and warehousing?
13. Write a short note on the factors which necessitate the need of warehousing?

14. What are the basic requirements of issuing negotiable warehouse receipts?

15. Write in brief about the steps taken in a post independent area to develop warehousing?

16. Describe relevant laws governing operational and local compliances of warehouses in India.

17. What are the laws concerning quality, safety and security of goods stored in warehouses.

18. What is Contract Labor (Regulation & Abolition) Act, 1970- discuss its implications in the services being rendered by food storage depots.

19. Discuss about history of pre and post- independence era warehousing in India.

20. Explain the salient features of Warehousing (Development and Regulation) Act, 2007?

## ANSWERS TO INTEXT QUESTIONS

### 13.1

1. c

2. d

3. food crisis at the time of distress.

4. Warehouse is therefore a planned space for efficient storage and handling of goods and materials whereas warehousing is the act or process of storing large quantities of goods in a storage place.

### 13.2

a. Royal commission of Agriculture.

b. Reserve Bank of India.

c. To report on the ways to reduce rural indebtedness.

**13.3**

i) Warehousing corporation act 1962

ii) Food corporation act 1964

**13.4**

i) a

**13.5**

i) No

ii) Yes

iii) Food Security

iv) b

## DO AND LEARN

Imagine a situation where you are in a location where there is no production of agri commodities but you need to provide food items to a large number of populations. What do you think about solving this issue? Give step wise solutions.

14

# NEED FOR SCIENTIFIC WAREHOUSES

In the previous lesson, you learned about the Warehouse viz., meaning, definition, and objectives. In this lesson, we shall discuss the Need for scientific warehouses. Warehousing plays a very important role in the demand and supply of various goods. It is a key component of the commodity supply chain which consists of the facilities and systems which add value to the products by providing efficient storage and distribution. Warehousing plays a prominent role in facilitating trade, distribution of goods across different segments, and improving economic development. The overall objective of grain storage is to preserve the quality which is influenced by various abiotic and biotic factors.

## LEARNING OUTCOMES

After studying this lesson the learner:

- identifies basis of setting warehouses and functions associated with warehousing;
- lists the role of scientific warehouses in storage of various commodities;
- acknowledges biotic and abiotic factors associated with grain storage;
- organizes the stored grain pests.

## 14.1 WHY WE NEED WAREHOUSING

We must not forget the immense role played by warehousing in the demand and supply of various goods (Fig 14.1) as discussed below:

**A. Seasonal Production**: We are aware that the agricultural commodities are harvested in certain seasons but the consumption or use takes place throughout the year. In

order to ensure uninterrupted supply, it is very much essential to preserve the commodities till the next crop.

**B. Seasonal Demand**: There are certain goods like fertilizers, pesticides and other agrochemicals, which have a seasonal demand based on type of crop, but are produced round the year in a production unit. It calls for the need to store these goods properly so as to make them available at the time of need.

**C. Continuous Production**: The industrial production in factories is a continuous process seeking adequate supply of raw materials. Warehouses are therefore required to store different types of raw material to meet demand of industries.

**D. Timely Supply**: Both industrial as well as agricultural goods are produced at some specific places but consumed throughout the country. It is therefore necessary to stock these goods near the place of consumption and arrange quick transport whenever required.

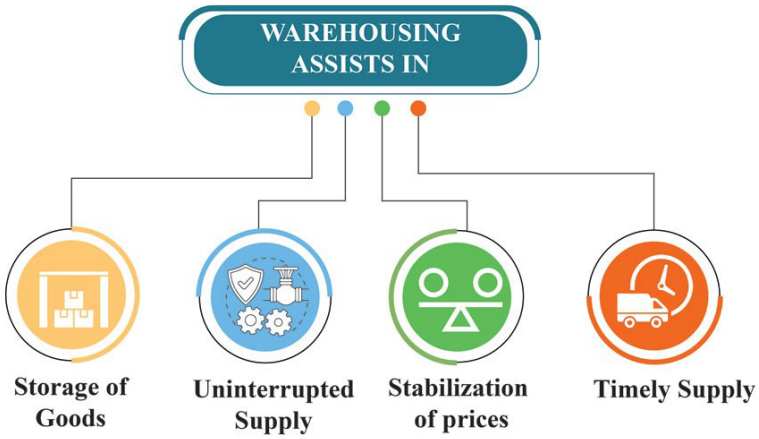



***Fig 14.1*: Role of warehousing**

**D. Stabilisation of prices**: Fluctuation in prices of goods takes place because of inefficient management of supplies as per demand. It is therefore important to keep a balance in the supply of goods vis-a-vis demand to maintain a reasonable level of price of goods in the market, which can be achieved through efficient warehousing practices.

## 14.2 FUNCTIONS OF WAREHOUSING

Warehousing, a key component of the commodity supply chain, consists of the facilities and systems which add value to the products by providing an efficient storage and distribution to them from the production areas to the consumers. The requirement of warehousing starts at the point of production or procurement of raw materials and ends at a point when it reaches the door of customers.

## Need for Scientific Warehouse

The Basic function of a warehouse is to preserve goods on a large-scale in a systematic manner. It provides protection to goods against fire, flood, cyclone, storm, heat, moisture, etc. and also cuts down losses due to damages. In addition to this, warehouses nowadays also perform a variety of other functions like grading and assaying, transportation, etc. The various functions discussed in this section help in integrating the role of warehousing as a tool of economic development. Some of the common functions performed by warehouses are listed below:

A. **Storage of Surpluses –** Warehouse acts as a place for storage to make available seasonal products all-round the year.

B. **Protection of goods –** The standard operating procedure of the warehouses provides for taking all the precautions for protecting the goods from various factors responsible for losses and damages during storage.

C. **Risk bearing –** Being a bailee of goods as per the law like the Indian Contracts Act, the warehouses have an obligation to take over the risks incidental to the storage of goods and are responsible to return the goods in good condition.

D. **Cleaning and Grading –** On request of the depositors, the warehouses can also provide cleaning and grading services to improve the quality of the goods. Since the quality is mentioned in the Negotiable Warehouse Receipts (NWRs), the depositors get a better price in the market or a higher value of the loan from banks against the pledge of NWRs. Warehouses do provide ancillary services like blending and packaging of goods for the benefit of their customers.

E. **Consolidation –** Warehouses help in consolidation of small quantities from a large number of farmers to create desired size of lot as per the shipment/trade requirement. The savings in outbound shipping costs based on economies of scale outweigh the small expenditure on warehousing costs.

F. **Product mixing –** A manufacturer producing different products at different locations may avail the services of a warehouse to create different product mixes as per the need of his suppliers/consumers.

G. **Processing –** Sometimes warehouses also undertake the processing of raw material on behalf of the owners.

H. **Traceability –** In order to track the movement of goods stored in warehouse technologies like Bar-coding or RFID (Radio Frequency Identification Devices) tagging, etc. are used in modern warehouses. While a Bar code may contain key information about the goods deposited, RFID tagging is a system which is capable

of holding large amounts of information about the product and its further movements.

I. **Financing –** A depositor gets a warehouse receipt for depositing goods in a warehouse. The receipt acts as proof of the deposit of goods. The warehouses can also issue a Negotiable Warehouse Receipt (NWR) in favour of the owner of the goods. So, while the goods are in the custody of the warehouse operator, the depositor can obtain pledge loans from banks and other financial institutions by keeping this NWR as security. Heavy and bulky goods can be loaded and unloaded by using modern machines leading to reduced cost of handling, besides lesser wastages in handling operations.

J. **Transportation –** In some cases, warehouses do provide transport arrangements to the bulk depositors at their request, by picking up their goods from the production point and delivering the same to the place of delivery.

K. **Distribution –** A warehouse may also take the responsibility of moving smaller quantities of a finished product to the market which was deposited in bulk quantity.

L. **Reverse Logistics –** The process of moving goods in reverse order from their final destination. If the product is defective, reverse logistics facilitate the process of collecting the defective products from the customer.

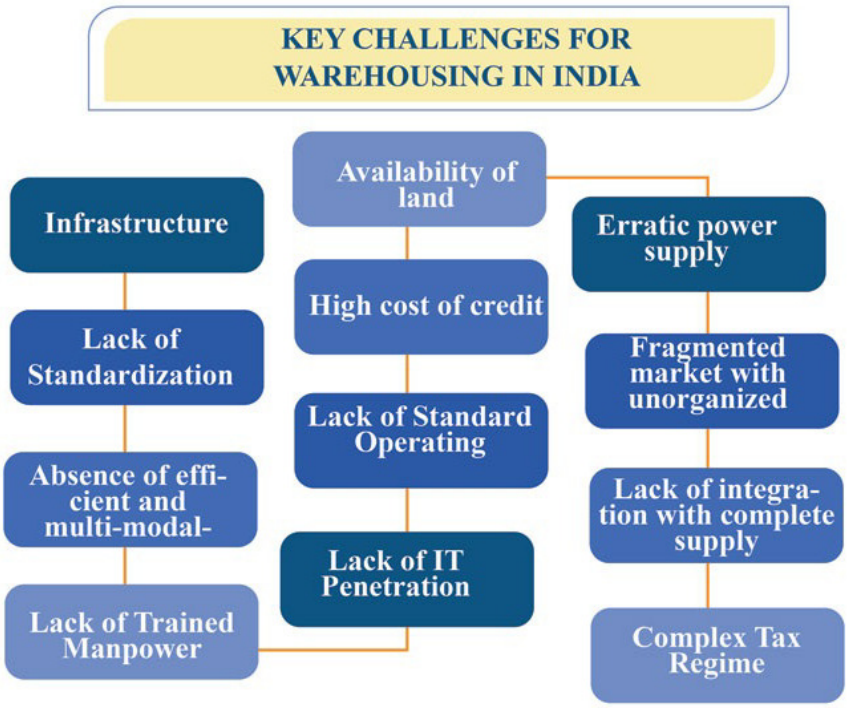
## INTEXT QUESTIONS 14.1

1. In order to ensure _____ of food-grains, it is very much essential to preserve the commodities till the next crop.
2. Fluctuation in prices of goods takes place because of _____ as per demand.
3. _____ provides services for inventory management and helps in balancing supply and demand.
4. Warehouse technologies like Bar-coding or RFID (Radio Frequency Identification Devices) tagging, etc. are used _____ in the warehouses.
5. The process of moving goods in reverse order from their final destination is known as _____.
6. The standard operating procedure of the warehouses provides for taking all _____ from various factors responsible for losses and damages during storage.
7. Do warehouses help in price stabilisation?

## 14.3 KEY CHALLENGES FOR WAREHOUSING IN INDIA

The Warehousing Industry in India in the private sector is largely controlled by unorganised players. Large numbers of such warehouses are traditional in structure and operate with an average size of approximately 10,000 square feet. Most of these warehouses have poor infrastructure, lack of standards and specifications, non-compatibility for mechanised operations, inefficient operations, resulting in pilferages and losses. In India majority of the warehousing (82%) is non-mechanized. and the balance 18%, the so called mechanised warehouses, just have facilities like forklift or handheld hydraulic pallet trucks.

In spite of emerging opportunities in the warehousing and logistics sector, its full potential is yet to be harnessed. There are a number of challenges being faced by Indian warehousing industry, which are elaborated as under:




1. **Infrastructure:** The warehousing industry in India is highly fragmented and disorganised in nature leading to poor infrastructure. Though there has been massive growth in the road/rail infrastructure, it is still inadequate to provide quality services, mainly in the rural areas.

**A. Availability of land:**

With rapid urbanisation, availability of land at strategic locations is a big challenge. The lack of clear land classifications in Indian cities and the reclassification of land are major

concerns as far as the development of warehouses is concerned. Cost of land in the logistic hubs have been unaffordable to set up a warehousing facility with adequate infrastructure.

### B. Erratic power supply

Regular power supply is required to operate storage structures on a consistent basis mainly cold stores and controlled atmosphere storage. Power failures are a major problem currently plaguing cold chains, leading to huge wastages of agri-products every year in India. Absence of regular power supply at a reasonable cost is a major deterrent for the growth of the warehousing sector, which further adds to the warehousing cost of agri-products and makes it uneconomical.

### C. Lack of standardisation

Quality of warehouses is a major concern as either the standards available are very old and not suitable to match with the changing industry requirement or there are no standards available for different types of warehouses created by the industry to meet their specific needs. This situation is a big challenge to regulatory compliance. There are multiple regulators for different components of the logistics sector with roles very thinly demarked resulting in poor monitoring and surveillance for compliance with rules/standards.

### D. High cost of credit

Non availability of adequate and timely credit at a reasonable cost is a critical factor. The main reason for this has been the high risk as perceived by banks about the un-organized nature of this sector and the high transaction costs for loan appraisal. Since a majority of the players in this sector are small or medium entrepreneurs, they are unable to provide collateral in order to avail of loans from banks and other financial institutions.

### E. Fragmented market with unorganised players

There has been massive growth in warehousing capacity but the sector is highly unorganised and fragmented. As a result, there is a highly underutilised capacity of warehouses created in a number of non-potential areas. On the contrary, there happens to be an acute shortage of warehousing facilities in niche areas. Transport and cold-chain logistics solutions are also dominated by unorganised small operators resulting in highly unreliable service coupled with breakdowns and damages to the cargo. There is shortage of organised big players in this sector.

### F. Absence of efficient and multi-modal-transport system

India is yet to fully develop a multi-modal transport system which could essentially harness



the full capabilities of road, rail, sea, and air transport infrastructure**.** Due to the inefficient multimodal logistics system, the goods are not carried end to end but held in transit at frequent locations leading to multiple handling, long transit time, and high costs. Efficient system is expected to reduce the overall logistics costs and extend the marketability of Indian companies by economies of scale. It will also facilitate the migration of companies from existing warehouses to future ready warehouses.

### G. Lack of Standard Operating Procedures (SOPs)

Many service providers don't maintain standard operating procedures, leading to frequent system failures, losses to warehoused goods, breakdown of services, accidents, frauds and non-settlement of insurance claims.

### H. Lack of integration with complete supply chain

Different components of supply chains work in a fragmented standalone manner leading to unsynchronized service patterns. This causes unexpected delays and damages adversely impacting credibility of the system.

### I. Lack of trained manpower

The warehousing operations in different sectors are highly specialised and need human resources with varied skill sets to handle various levels of managerial functions as well specialised services related to each sector. There is a dearth of training institutions to provide skill and capacity building through customised and tailor-made programmes. There is also a lack of good trainers to impart such specialised training. The challenge is higher in the manufacturing and retailing sector which require a mix of technology, managerial competence and sales/ marketing skills. Entrepreneurship development in this sector is also a big challenge. Intelligent, automated and organised warehousing is the need of the hour to meet the requirements of Industry.

### J. Lack of IT penetration

The warehousing sector in India, with some exceptions, is characterised by low penetration of technology that acts as a handicap in the emerging Indian economy. Large numbers of public sector warehouses and small rural warehouses including cooperatives badly lack IT skills and are thus not confident in adopting computer aided operations. These entities are left behind in the fast growing industry

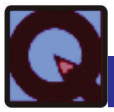
### K. Complex Tax Regime

Before the implementation of a uniform tax structure Goods & Service Tax (GST), the majority of manufacturers in India used to maintain their warehouses across the marketing

network to avoid taxation under interstate sale under the Central Sales Tax Regime (CST). The implementation of GST i.e. single tax structure across Indian states is expected to do away with this practice of operating through small, scattered warehouses to large, mechanised, centrally monitored warehousing in India which will bring cost efficiency to industry and service sector engaged in non agri-warehousing. In case of agri-warehousing, though implementation of GST helps in avoiding applicable state level sales and Centre level sales tax and excise duty structure but applicable varying MandiCess across states and multiplicity of incidence of Mandicess pose a big challenge.

**Activity:**

Why should I invest in warehouses when I can get everything from the market?



## INTEXT QUESTIONS 14.2

1. Availability of land at strategic locations is a big challenge because

   i) The lack of clear land classifications in Indian cities

   ii) Cost of land

   iii) Both i & ii.

   iv) None of these.

2. Power failures is a major problem currently plaguing cold chains, leading to-

   i) Huge wastages of agri-products every year in India.

   ii) High cost of preservation.

   iii) Not an issue.

   iv) Both I & ii.

3. Lack of Standard Operating Procedures (SOPs) results in

   i) Frauds, accidents,

   ii) Losses to warehoused goods,

   iii) Non-settlement of insurance claims.

   iv) All of the above.



## 14.4 WAREHOUSING TOOL OF ECONOMIC DEVELOPMENT

Massive growth in the logistics sector has influenced the growth of the warehousing sector as well. Integration of various ancillary services with the core warehousing business has been observed. These changes have encouraged the entry of many new players in the sector and opened vast potential in terms of new jobs and service-oriented business opportunities. With likely development of massive rail, road and port infrastructures, growth of warehouses is bound to achieve new dimensions. Transit warehousing is another area which is growing fast. Organisations like Central Rail side Warehouse Company Limited (CRWC), Transport Corporation of India, Airport Authority of India, Container Corporation of India and many other logistics service providers are contributing immensely towards the expansion of transit warehousing facilities. Warehousing , therefore, plays a prominent role in facilitating trade, distribution of goods across different segments and improving economic development.

## 14.5 BENEFITS OF WAREHOUSING

There are several advantages to the farmers and other stakeholders in availing warehousing services -

a. It gives withholding power to the farmers and helps them realise better prices. It enhances farmer's access to credit against the stored produce by pledging the warehouse receipt.

b. It gives purchasing power to the traders, and acts as collateral security.

c. It tends to cushion price fluctuations and stabilise prices as it equates supply to demand.

d. It facilitates futures trading.

e. It plays a very important role in implementing the agricultural price policy of the country.

f. Huge wastage which occurs owing to improper storage of agricultural produce is minimised.

## 14.6 COMMODITIES TO BE STORED

The Agricultural Produce (Development & Warehousing) Act of 1956 provided the storage of agricultural produce in the warehouse, which was defined to mean any of the following classes of commodities namely:-

- Food stuffs, including edible oil- seeds;

- Cattle fodder including oil cakes and other concentrates;
- Cotton in different forms;
- Raw jute; and
- Vegetable oils

However the concept of notified commodities was introduced when Warehousing Corporation Act, 1962 was passed. The expression notified commodities has been defined under section 2(e) of this act to mean any commodity (other than agricultural produce) which the Central Government may, by notification in the official Gazette, declare to be notified commodity for the purpose of this act, being a commodity with respect to which Parliament has powers to make laws by virtue of entry 33 in List III in the seventh schedule to the constitution. Accordingly, different commodities are added as notified from time to time by the Government.

## INTEXT QUESTIONS 14.3

1. Name 3 logistic service providers.
2. Name which type of commodities was permitted for storage as per Warehousing Corporation Act, 1962.

## 14.7 SCIENTIFIC STORAGE OF AGRICULTURAL COMMODITIES

Once the stock is accepted and stacked in the warehouse, in charge would be required to exercise all the processes to preserve their quality during storage. Common steps are detailed as under:

**A. Hygiene and Sanitation**– Sanitation and good housekeeping inside as well as outside storage space is the best pest control measure as proper sanitation not only helps in prevention of pest population build up but also removal of pest habitat. Many a times lack of proper sanitation measures lead to undesirable grain debris in the storage environment, which create most favorable conditions for the growth and development of pests. It therefore calls for timely collection, cleaning of grain spillages not only from the storage structure but from the entire surroundings. It is estimated that proper hygienic conditions along with proper aeration can overcome 85 percent of storage pest problems Growth of undesired vegetation in the premises, cracks in walls and floors, leakage in the roof, damaged doors and ventilators must be checked at periodic time to deny easy accesses to moisture, insects, birds, rats etc.



**B. Aeration** – Regular circulation of dry and extremely cool air through the stacks helps in killing many insect and microbial pests and in maintaining the moisture at a low level which is good for the health of stored produce. Provision of turbo ventilators and regular opening of godown doors/ventilators during dry/cool weather are helpful in this direction.

**C. Procedure for internal verification of stocks** – Periodic verification of the quality of stored products in the warehouse is an important procedure to be put in place for knowing the health of the stocks. Normally it is recommended at fortnightly intervals however the warehouse operator can prescribe even a shorter interval depending upon the specific condition of the stored goods.

**D. Prophylactic & curative treatments-** The fumigant is a chemical that remains in gaseous form in ambient atmospheric conditions and is capable of killing the insects and other harmful pests if exposed to them in a prescribed dosage in an airtight enclosure over a specified exposure period. Fumigation of agricultural produce is undertaken with Aluminium Phosphide which comes in the form of tablets of 3 grams containing 56% of this chemical and the remaining 44% comprising Ammonium carbamate, binding materials, and fillers. A dosage of 3 tablets of this fumigant (9 gram) per tonne or 2.25-gram phosphine gas per cubic metre of the storage volume is recommended with a minimum of 7 days of exposure, under an airtight enclosure to kill all the stages of all insect pests.

**a. Rodent pest Control** - It is foremost needed to take various preventive measures to check entry of rats in warehouses. These include preventing the entry of rats by maintaining plinth height of nearly 90 centimeters, minimising the gap between doors and floor, sealing gaps/holes in the walls, floors etc. Physical measures like different types of cages and trapping or adhesive boards are used to catch and control rats. The rats may also be controlled with poison baits using rodenticides like zinc phosphide, Barium carbonate, bromadiolone and brodifacoum . The fumigation of rat burrows is also done outside the godowns with aluminum phosphide pellets to kill the outside rats.

- **Turnover of stocks –** It is important to ensure turnover of stock undertaking deliveries in FIFO (first in first out) mode. However, the stock should be liquidated within the shelf life of the product. Deteriorating or substandard products may also be liquidated on priority.

- **Extension of storage period –** When the goods are deposited for storage in a warehouse, the warehouse receipt is issued which is valid for a limited period, within its shelf life. However, in case the depositor wants to extend the validity of the warehouse receipt, it can be done provided the quality of

the goods is retested and it is found within permissible limits. The validity of warehouse receipt, in no case, will be extended beyond the shelf life.

## 14.8 FACTORS AFFECTING STORABILITY OF AGRI COMMODITIES

The overall objective of grain storage is to preserve the quality which is influenced by various factors, which can cause damage to the stored food materials. These are divided into two categories, (i) Abiotic factors and (ii) Biotic factors.

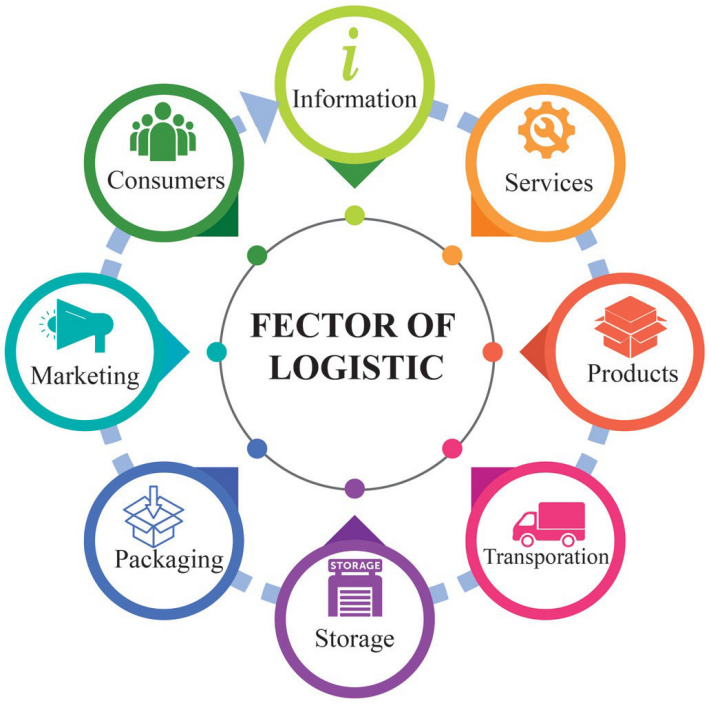



***Fig 14.2:*** **Factors affecting Logistics**

### (i) Abiotic factors:

Abiotic factors have a significant role in grain preservation. These are the factors, which are not due to any living organism. Abiotic factors determine the survival, growth and multiplication of biotic factors in the grain storage system. The various abiotic factors which damage the stored food materials are discussed below-

**A. Moisture:** If the grain moisture content is too high, even the best aeration equipment and monitoring management will not prevent the grain from spoiling - it only delays the inevitable. All micro-organisms, including moulds, require moisture to survive and multiply. Moisture should therefore be prevented from entering the store. The moisture content below which micro-organisms cannot grow is referred to as the



safe moisture content. In general, it is essential that all food stuff is kept below its safe moisture content before they enter the store. Commodities with high moisture levels are prone to infestation and deterioration.

**b. Temperature:** Temperature is an important factor for the safe storage of food-grains and other food materials as it affects the growth of insects and microorganisms which attack the stored food materials. The insects which attack the stored food-grains have maximum growth rate between 30 – 32 °C. Microorganisms and enzymes which damage the food materials are most active between 30–40 °C. Therefore, the damage to the stored food materials can be significantly reduced by storing them at lower temperatures.

**c. Initial grain condition:** Grain condition refers to its quality. Grain must be dried to a lower moisture content to allow it to be stored for a longer period of time. Grain quality will not improve during storage. At best, initial quality can only be maintained. During the post-harvest phase, grain undergoes complex biochemical changes termed 'ageing', thereby affecting its quality in long storage**.** The presence of increased amounts of cracked; damaged kernels in stored grains can increase spoilage, thereby reducing its quality. Breakage of grains reduces quality by reducing acceptability and by increasing susceptibility to infestation during storage.

**d. Foreign matter:** The presence of foreign matter beyond permissible limits induces insect pest activity, impedes effective aeration and also reduces the mercantile value of the stocks besides affecting handling and processing. It renders the grain unfit for consumption and can pose a serious threat to health, probably from micro-contamination with the bacterial products of poor sanitation.

**e. Light:** Most of the stored grain insect pests are photonegative and tend to show activity after sun sets in search of food. Monitoring and pest control strategies need to be developed accordingly.

## B. Biotic factors:

The main biotic agents causing deterioration of stored grains are microorganisms (fungi, bacteria, and yeast/mould), insects and mites, rodents, birds, and metabolic activities. The type of damage varies depending upon the crop variety, type of pest, ecosystem, and storage handling system.

**a. Insects:** Insects are the major causes of post-harvest grain losses by penetrating the kernels and feeding on the surfaces / endosperm. Insect pests selectively take the nutritious part of the food and encourage the development of bacteria and mould activity. This eventually leads to other storage problems, in turn raising temperatures

and resulting in an increased rate of insect reproduction. Most storage insects carry over from previously stored grain, so it is important to detect any residual infestations.

b. **Microorganisms:** Fungus like Fusariumsps and Rhizoctonia Sp thrive in grains under favourable temperature and moisture conditions and make grain unfit for human consumption. **(Fig 14.3 (a)** )It is, therefore, required to bring moisture to desired level before storing a commodity. Regular aeration also has an important role in checking growth of microorganisms.

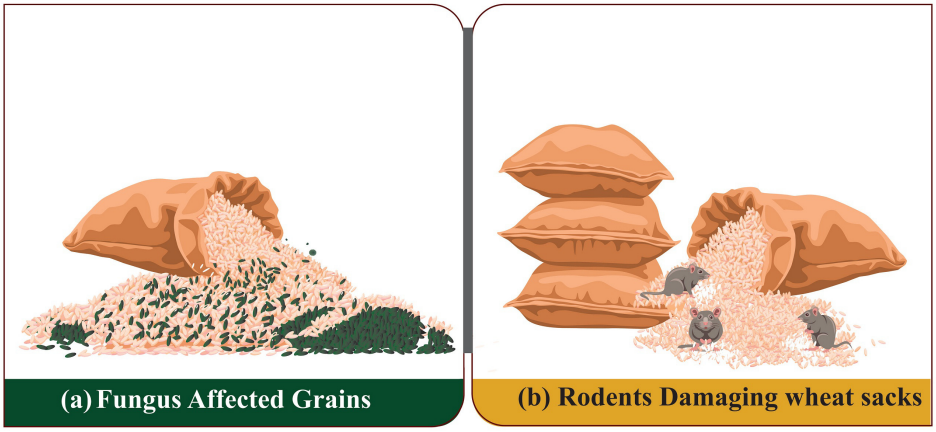



*Fig 14.3:* **(a) Fungus affected grains and (b) Rodents damaging wheat sack.**

c. **Rodents:** The types of rodents that cause damage and contaminate the food-grains are house rats, mice and bandicoots. They cause damage to commodities by nibbling jute bags and eating food-grains**. (Fig 14.3 (b)**) The quantity of food-grains contaminated by them with their excreta, urine and by shedding the hair, is more than what they actually consume. Normally the warehouses are designed in such a way that the rats do not find an easy entry into the warehouse. Maintenance of hygiene of storage areas and rat proofing of warehouses are the two most effective measures to avoid rat menace.

d. **Birds:** Birds enter a warehouse from various openings in the warehouse and cause loss by consuming the food grains and contaminating them with their droppings. Normally the godown structures are made bird proof by fixing wire mesh at ventilators and providing sliding doors with wire mesh. Wherever sliding doors are not provided, nylon door nets are hung at the doors to prevent the entry.

## 14.9 GRADING & SAMPLING

Directorate of Marketing and Inspection, an organisation under the Ministry of Agriculture and Farmers Welfare enforces the Agricultural Produce (Grading and Marking) Act, 1937. Under this Act, Grade and Standards are prescribed for agricultural and allied

products in India. Agmark, an acronym for agricultural marketing, is a quality certification mark provided by the Government of India. Farm Level Grading i.e., grading at Producer's Level is also done and Quality Certification Mark provided by AGMARK acts as a third-party guarantee for the Quality Certified. The Legal backup for the same is provided under Agricultural Produce (Grading and Marking) Act, 1937 as amended in 1986.

### A. The need for sampling

Batches of grain are rarely uniform in quality even when regarded as acceptable. Pests usually occur non-randomly in stored grain. Consequently the only way of obtaining complete and accurate information about the grain is to carry out a total examination. This may be possible if the quantity to be examined is small, but is usually neither practical nor economical when a large quantity is involved. The choice is either not to examine the consignment at all or to take samples to obtain some information, acknowledging that anything less than a total examination is bound to affect the accuracy of the results.

### B. Type of samples

Representative samples are made by combining many smaller samples into one larger composite sample. Representative samples are grain samples that accurately represent a specific quantity of grain, such as the contents of an entire grain lot. The composite sample accurately represents the entire lot of grain. The composite sample can then be used for grading. Drawing of representative samples is an important and essential part of grain analysis. If the sample obtained is not representative, no amount of care in analysis will establish the true quality of grain.

## INTEXT QUESTIONS 14.4

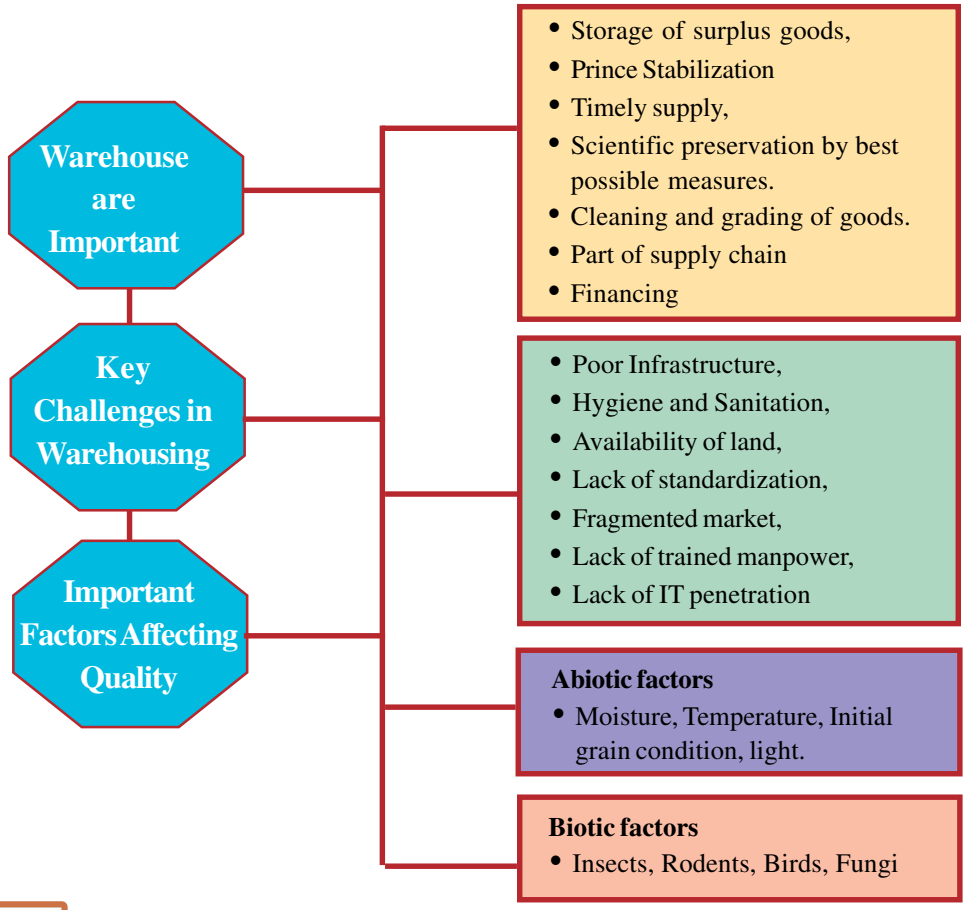
1. _____and _____ in side as well outside storage space is best pest control measure.
2. _____is an effective non chemical practice to improve the storability of grains.
3. Spraying pesticides like Malathion 50EC and Deltamethrin 2.5%WP are called _____.
4. Commodities having high moisture levels are prone to _____.
5. Microorganisms and enzymes which damage the food materials are most active between_____ .
6. The presence of an increased amount of cracked, damaged kernels in stored grains can increase _____ thereby _____its quality.

7. _____ cause damage to commodities by nibbling jute bags and eating food-grains.

8. _____ are grain samples that accurately represent a specific quantity of grain, such as the contents of an entire grain lot.

9. _____ _ is a quality certification mark provided by the Government of India for agricultural marketing.

## WHAT YOU HAVE LEARNT




## KEY TERMS

| | | |
|---|---|---|
| Demand and supply | Supply chain | Pledging |
| Infrastructure | Standard Operating Procedures | Sanitation |
| Sampling | Abiotic | Biotic |

## TERMINAL EXERCISE

1. List one important factor which can help in checking micro flora _____ aeration
2. The presence of foreign matter is a biotic factor _____ no
3. Jute is a notified commodity._____ no
4. Write full form of RFID _____
5. Construction of a warehouse is capital intensive, so why waste money on it and manage direct distribution from producer to consumer——— False.
6. Why do we need warehouses?
7. Comment on the statement "Warehousing is a tool of economic development"
8. What do you understand from notified commodities?
9. What is the grading of agricultural commodities required?
10. Briefly list benefits of public warehousing?
11. What important steps are necessary to monitor the health of the food grains in the warehouse?
12. Discuss in detail various functions of the warehouse?
13. What are different types of challenges faced by the Indian warehousing industry?
14. Explain various factors affecting storability of agri commodities?
15. What is Scientific Storage of Agricultural Commodities, please explain?

## ANSWERS TO INTEXT QUESTIONS

1. Aeration
2. No
3. No
4. Radio Frequency Identification Devices
5. False

## 14.1

1. Uninterrupted supply, 2. Inefficient management of supplies, 3 Warehouse,
4. To track the movement of goods 5. Reverse Logistics.
6. The precautions for protecting the goods. 7. Yes

## 14.2

1. iii 2. iv 3. iv

## 14.3

1. Central Rail side Warehouse Company Limited (CRWC), Airport Authority of India, Container Corporation of India.
2. Notified Commodities.

## 14.4

1. Sanitation, good housekeeping
2. Aeration
3. Prophylactic treatments
4. Infestation and deterioration.
5. 30–40 °C.
6. Spoilage, reducing
7. Rats
8. Representative samples
9. Agmark

**DO AND LEARN**

Do you think grain quality is important and how a warehouse can help in ensuring good quality at all times?

15

# TYPES OF WAREHOUSES

In the previous lesson, you learnt about the need for scientific warehouses. In this lesson we shall discuss types of warehouses i.e. government, private, bonded. Warehouses can be classified into different categories based on management, functional and structural basis. All public warehouses are required to obtain a license from the government. Central Warehousing Corporation, State Warehousing Corporation are government owned public warehouses. The bonded warehouses are used to store imported/excise goods under an undertaking or 'bond', which does not allow the release of goods until the relevant duties are paid. The overall performance of the warehouse depends upon the quality of services provided to its customers either directly or through service providers. The introduction of Negotiable Warehouse Receipts has led to better trust of depositors and financial institutions.

## LEARNING OUTCOMES

After studying this lesson the learner:

- explains various types of warehousing sector;
- assesses the changing role of warehousing industry;
- discusses various components associated with warehouse operations;
- identifies the need for infrastructure based on type of storage requirement.

## 15.1 TYPE OF WAREHOUSES

Warehouses can be classified into different categories based on management, functional and structural basis. The need for minimizing post-harvest losses, provision of food security to entire masses, has propelled the development of improved storage systems for different types of commodities non–perishables as well as perishables, to ensure



uninterrupted supply of agricultural produce throughout the year. In pursuit of growing international trade and manufacturing ventures the concept of CFS and ICDs has become more popular because of easy maintenance and reduced pilferage of cargo. Different types of warehouses are described as under-

### 15.1.1. Based On Management

#### A. Public Warehouses

The warehouses are commercial ventures, which are run to store goods of the general public. It means anyone can store goods in these warehouses on payment of prescribed storage charges. Generally these warehouses are located near to transportation points like railways, highways and waterways, catering the facilities of receipt, dispatch, loading and unloading of goods.

#### B. Private Warehouses

Such types of warehouses are owned and managed by the manufacturers or traders or even large growers for their exclusive usage are known as private warehouses. Generally, these warehouses are constructed by different users as per their requirement like the farmers construct near their fields, wholesalers and retailers near their business centers and manufacturers near their factories. The design and the facilities provided are not standard and have no uniformity as these are made according to the nature of products to be stored.

#### C. Cooperative Warehouses

These are, generally, small capacity warehouses owned, managed, and controlled by co-operative societies. These cooperative warehouses provide warehousing facilities at the most economical rates to the members of these cooperatives and farmers. Because of their proximity to farmers, these warehouses are preferred by small farmers to store their produce.

#### D. Field or Management Warehouses

Such warehouses are based on an agreement between godown owner / depositor/ producer or customer and a collateral management or credit support company to undertake the management of the warehouse and take up responsibility for the physical control of the commodities and all the services of a warehouse on a mutually agreed payable charges. Such stock can be used as collateral for the sake of commodity financing. Lending institutions generally avoid lending the owners of stocks, which are laying under their control as in case of a private warehouse.



### 15.1.2. Based On Operations

#### A. Government Warehouses

These warehouses are owned, managed and controlled by central or state governments or public corporations or local authorities. Both government and private enterprises may use these warehouses to store their goods or public goods. Central Warehousing Corporation, State Warehousing Corporation and Food Corporation of India, Civil Supplies Corporations etc. are examples of the government warehouses.

#### B. Private sector warehouses

Warehouses owned and managed by private entities including individuals, companies, societies, partnership firms etc. come under this category. These warehouses can act as a private, public or management warehouse depending upon the situation.

#### C. Bonded Warehouses

Bonded warehouses can be custom bonded or excise bonded warehouses. Accordingly, these warehouses are used to store imported or excise goods for which import/excise duty is yet to be paid. In the case of imported/excise goods, the importers/manufacturers are not allowed to take away the goods from the warehouse until such duty is paid.

The concept of bonded warehouses was developed to facilitate the deferred payment of customs/excise duty by entrepreneurs, manufacturers, exporters and importers, to enable them to carry out their operations with minimum investment. These warehouses are used to store imported/excise goods under an undertaking or 'bond', which does not allow the release of goods until the relevant duties are paid. Such warehouses are generally established near ports or industry hubs and are owned, managed and controlled by Government as well as private agencies after obtaining a licence from the government.

#### D. Container Freight Stations (CFS)/Inland Container Depots (ICDs)

CFSs/ICDs are a custom-bonded facility with public authority status for the handling and storage for containers. Such stations are equipped with proper infra- structure for warehousing, handling equipment and an IT enabled system for import/export of different cargo. Services of CFS/ICDs include the following:

- Loading/unloading
- Receipt/dispatch of goods
- Transit operations by road/rail to and from the port

- Stuffing/destuffing of containers
- Customs clearance
- Consolidation and desegregation of Less than Container Load (LCL) cargo
- The temporary storage of cargo and containers
- Repair and maintenance of containers
- Refrigerated warehousing
- Hub-and-spoke services

CFS is an important component of the supply chain, which acts as a distribution facility, to consolidate and deconsolidate different consignments meant for import /export. It is a system which performs all activities of a port with the objective to avoid congestion at India's ports/ terminals. This is an Indian concept but accepted at international level.ICD, is located away from the port. CFSs/ICDs also act as transit storage locations and help to comply with all custom compliances, reduce damage/pilferage and optimise container utilisation and economise the operations. CFS/ICD provides all the facilities available at the ports and is sometimes also referred to as dry ports. Once integrated with the multimodal transportation system, they greatly reduce the logistics cost thereby making imports/exports economical.

### 15.1.3 Based on Warehouse Infrastructure

**A. Conventional storage –** These are also called dry warehouses, capable of storing a large variety of agricultural and non-agricultural goods which don't deteriorate under ambient conditions. (***Fig 15.1***)These warehouses provide safe and economical

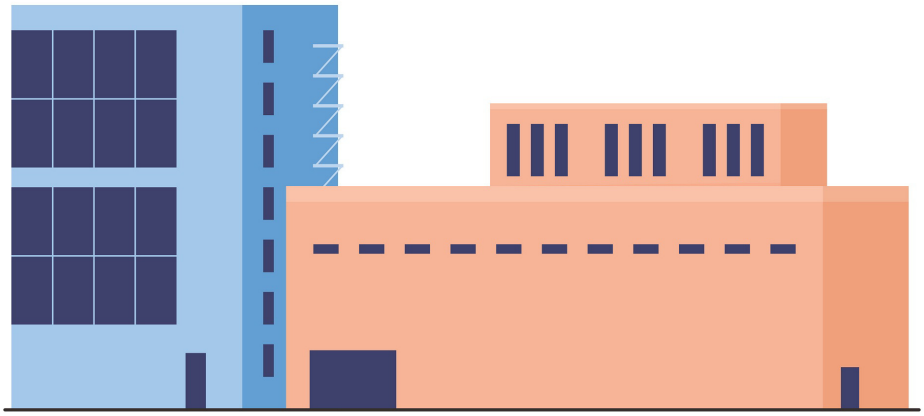


***Fig 15.1:*** **Conventional warehouse**



storage. These are located at a site away from sources of contamination, fire, flood etc. The conventional warehouses are at a safe height from ground level i.e. having the plinth height sufficient to check water seepage or entry of rats. The walls are strong enough and the roof is made of corrugated sheets supported by trusses. There is a proper system of selective and cross ventilation. The floor is seepage proof and packaged stock is stacked in different patterns to keep it stable for a longer period. The warehouse has a proper boundary wall or barbed wire fencing. Conventional warehouses are to be constructed as per **IS: 16144:2014**

**B. Cold Storage -** A cold storage is a temperature controlled storage space, which provides proper storage to perishable goods such as agriculture, horticulture, fisheries and aquaculture, dairy and processed food. The cold storage market in India is highly fragmented and over 50% of it is utilised for potato storage, while the rest is used for other commodities. The main activities involved in cold storages are asunder:

- Aggregating
- Sorting
- Pre-cooling
- Packaging from farms to manufacturers

Integrated cold storage with cold chain facilities of temperature-controlled transportation, linking farm-level storage facilities, processing units and distribution outlets has high potential in India. This not only improves efficiency but also solves the problem of wastage of agri.-horticultural products. Private investment in the cold chain is gradually growing, thanks to different government incentives in terms of taxes and duties. However, there is ample potential in the sector to be harnessed.

**C. Controlled Atmosphere Storage (CAS) System -** controlled atmosphere storage is an agricultural storage method in which the concentration of oxygen, carbon dioxide and nitrogen, as well as the temperature and humidity of a storage room chamber, is regulated to keep the produce fresh over a long storage period. It is equally suitable for dry commodities as well as fresh fruit and vegetables.

**D. Silo -** Silos are most commonly used for bulk storage of grains and other bulk material like coal, cement, carbon black, woodchips, food products and sawdust. Silos come in a wide variety of shapes (round or angular, standing horizontal or vertical) and can be constructed from several different materials. However, grain silos commonly consist of several vertical cylindrical bins having a height greater than their diameter and are fitted with necessary equipment and accessories for

lifting, conveying, filling, removing the material and its weighing, sampling, testing, fumigation, etc. These are generally made of steel (***Fig 15.2***) or reinforced cement concrete.

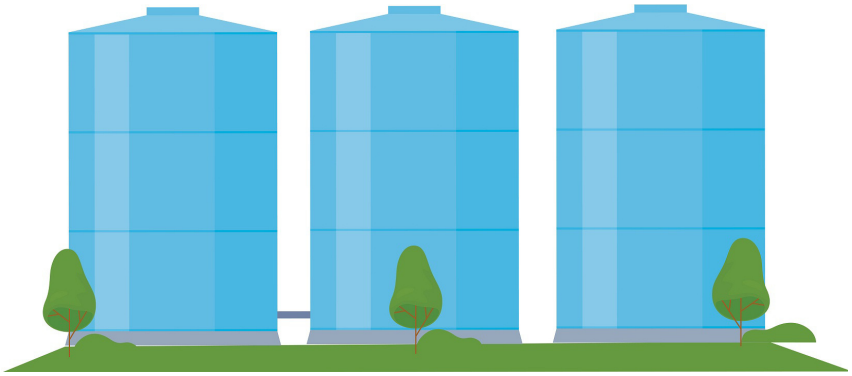


***Fig 15.2:*** Steel silos

**E. Tank Storage** – Tanks are containers that are used to store liquids (edible oils, petroleum, mineral oils, chemicals etc.) or compressed gases. These tanks have different shapes like vertical/horizontal cylindrical, open-top/closed top, flat bottom, cone bottom etc., which can be positioned either above ground or underground. Above ground, tanks are the most commonly used storage system for most of the edible/mineral oils, petroleum products. Large capacity tanks are mostly vertical. These tanks are sometimes mounted on a trailer/lorry called a tanker or on a container called a tank container. The tanks are made of different materials like steel /concrete for general liquid cargo or glass-reinforced plastic, thermoplastic and polythene for chemicals. The tanks must be strong to sustain liquid pressure during transport

**F. Multi-storey warehouses** – These warehouses offer a solution for the shortage of space in areas with high pressure of urbanisation and increasing population. These warehouses provide a solution for storage space in a multi-storey set up per square foot of land. Multi-storeyed warehouses are getting popular in India as well. A successful multi-storeyed warehouse has to be integrated with a great degree of mechanisation and automation.

**G. Automated warehouses** – These warehouses are capable of providing an effective system with a great deal of technological integration with least human intervention. Multiple functions of warehousing viz. off-loading, conveying, lifting, stacking, de-stacking, sampling, assaying, controlling theft, fire, etc. are managed with intensive use of information technology. All gadgets and devices are fitted with sensors and are connected via the Internet, which ensures better connectivity, better coordination



and seamless operations. Internet of Things, Cloud Computing, Big Data Analytics, Robotics and Automation make these units as intelligent warehouses.

### 15.1.4. Based On Effective Control

The warehousing industry is highly capital intensive, highly competitive and full of business uncertainties, therefore the operator must take thoughtful decision to either construct a warehouse or to look for other safer possibilities of holding a warehouse as discussed below:

**A. Owned Warehouses** - The operator owns the land, building and infrastructure of the warehouse as exhibited by the record of rights of the land, or a registered title deed in respect of the land, on which the warehouse concerned is located.

**B. Leased warehouses** – Because of highly volatile business dynamics in public warehousing, a large number of warehouses are not owned by the operator but taken from the owner of an existing warehouse in return of a mutually agreed consideration often referred to as a lease agreement. A lease is a contractual arrangement in the form of a deed or an agreement between the owner of the warehouse and the user or operator of the warehouse, wherein, the lessee (user) is obliged to pay the less or (owner) an agreed amount for use of his warehouse.

**C. Sub leased warehouses** – In some cases of leased warehouses, the owner of a warehouse allows the lessee to sublease or sublet the premises to some other person to make sure that the warehouse is gainfully utilised with continued returns on the property. Depending on the situation, the warehouse operators also find it beneficial to lease space from another lessee which helps in his business in terms of price, location and size. This requires a sub- lease agreement between the lessee and the new person who becomes a sub – lessee. However, the master lease agreement shall allow sublease and other terms and conditions enlisted in the sub-lease agreement.

**D. Rented warehouses** – Renting a warehouse provides a better business option to the warehouse operator as he is not required to pay the lease amount in a lump sum but in a deferred way in the form of rent. Rent agreement is executed which is an official contract signed between the owner of a property and the tenant for a specified period with details of property and the amount of the rent for the said term.

**E. Warehouses taken on revenue sharing arrangement** – A revenue sharing arrangement is executed when the warehouse owner and the operator wish to enter into a joint venture wherein the owner's contribution is the warehouse and operator's contribution is his investment in terms of other resources for running the warehousing

business as outlined in the agreement. A revenue sharing agreement enlists the specific details as to how revenues from a joint venture will be shared between two or more parties. A revenue sharing agreement is an essential document to be developed whenever two or more parties enter into a joint venture project together.

## INTEXT QUESTIONS 15.1

1. Warehouses are classified based on

   a. Management
   b. Functional
   c. Structural basis
   d. All of the above.

2. The development of improved storage system is necessary because of

   a. Different types of commodities
   b. Minimising post -harvest losses
   c. International trade.
   d. All of the above.

3. Services of CFS/ICDs does not include the following-

   a. Loading/unloading
   b. Receipt /dispatch of goods
   c. Bulk storage of grain
   d. Customs clearance.

4. The warehouse operator must take thoughtful decision to either construct a warehouse or to look for other safer possibilities because of

   a. Highly capital intensive
   b. Highly competitive
   c. Business uncertainties
   d. All of the above.

5. Silos could be made of

   a. Steel
   b. Concrete
   c. Different shapes
   d. All of the above

## 15.2 SERVICE PROVIDERS

Warehouse is providing various services apart from storage to its customers, which include handling, transportation, weighing, insect/pest control, assaying / testing of the quality of goods deposited, security and other services. The overall performance of the warehouse depends upon the quality of services provided to its customers either directly or through service providers. The warehouse is therefore required to maintain a list of effective and efficient service providers in all these fields.



Selection of the right vendor is to be made based on capability of the service provider with reference to his possession of required operational equipment, trained manpower and financial capability. In case the services of some outsiders are utilised for instance - weighbridges, these should be duly stamped and licensed by the State Weights and Measures Department

The warehouseman must undertake periodic monitoring to evaluate the service provider at least once in a year depending upon the nature of services availed keeping in view the following parameters:

- Availability of suitable handling and transportation equipment.
- Performance during the period under review for timely completion of jobs.
- Payments of demurrage / wharf age.
- Instances of labour problem.
- Continued availability of trained manpower.
- Regular compliance with applicable legal requirements.
- Instances of shortages during transit, as applicable.

All such evaluations need to be documented so as to take necessary corrective action as and when required, based upon the results of evaluations. It will help in ensuring efficient services to the best satisfaction of its customers.

## 15.3 KEY FACTORS FOR PROMOTING WAREHOUSING

In the backdrop of increasing domestic consumption and the cost effectiveness of outsourcing manufacturing activities, India is becoming a manufacturing hub for most of the industries including agro-processing industry. This is translating into higher demand for logistics services, including the requirement of warehousing space. Major industry users include operators of the food, chemical, engineering, pharmaceutical and automobiles industry.

### 1. GDP growth and demographics

Growing GDP in India, increasing population and improved purchasing power are creating new demand for goods and commodities. Increase in demand for processed food as a result of growing disposable income, urbanisation, is leading to higher industrial production and more demand for warehouse space. Besides changing lifestyle and increasing expenditure on health and nutritional foods also call for additional storage space.



### 2. Increase in agri. Production

The concerns of our government for ensuring food security for one and all has led to an increase in irrigated area and higher agricultural production. As per latest estimates, the total food grain production is estimated at approximately 316.06 million tonnes during 2021-22.

### 3. Industrial growth

Demand for high-end services and infrastructure, driven by the greater presence of MNCs and increase in end-user industries (such as food, textile, pharmaceuticals, automotive and engineering goods), higher agri exports is creating new storage space requirements. All such factors have prompted the growth of more organised warehouses with better value-added services and facilities.

### 4. Investment by multinational companies

A growing agriculture sector, abundant livestock, cost competitiveness and factors like liberalisation and growth of organised retail have made the Indian market more attractive for global players particularly in the field of food processing. Huge investments are being made by various international companies.

### 5. Growing exports

Strategic geographic location and continuous increase in raw material production help India to supply cheaper products to other countries. Rising exports particularly of food processing items are supporting warehousing growth.

### 6. Increase in organised retail

Both domestic and global firms are moving up the value chain, for example, cooperatives are transitioning from being pure producers of milk to offering a wide range of dairy products. Increased organised retail activities with requirements for storage and distribution space are promoting demand for modern warehousing.

### 7. GST implementation

The Government's adoption of uniform Goods and Service Tax (GST) has helped in phasing out of Central Sales Tax (CST). This change is resulting in realignment of logistics services including demand for warehousing space around production centres as well as major consumption conglomerates across the nation. GST would enable manufacturers to store and distribute goods across the country without any state boundaries. The move will enable higher growth and consolidation in the warehousing industry.



## 8. Value added services and global competition

Changing business dynamics and the entry of international players has led to rebuilding of the supply chain, including logistics and warehousing services in India. Logistics is not a mere combination of transportation and storage services but a strategic function involving end-to-end value-added solutions, to improve the efficiency of the supply chain. The increased demand for better services at lower costs, has led to the emergence of organised warehousing in the country. Warehousing players are now stressing on efficient inventory management systems, with greater emphasis on value-added services such as consolidation, labelling, packaging and repackaging, bar-coding, distribution, custom clearance service, customer service and reverse logistics.

## 9. Increasing volumes and use of technology

Agriculture supply chain in India suffers from inefficiencies leading to heavy losses due to lack of proper storage and transportation facilities. Poor front-end infrastructure, such as storage facilities, improper warehousing facilities, redundant food processing technology and farmers' inaccessibility to value-added services, results in huge wastages of the fruits and vegetables. Growing annual agriculture production, participation of the private sector in agri-warehousing is making this segment more competitive. Improving the quality of agri-warehouses with the use of technologies will help to reduce agricultural waste.

## 10. Warehousing (Development & Regulation) Act

The Warehousing (Development and Regulation) Act 2007 (WDRA) aims to standardise warehousing operations, make warehouse receipts (WRs) negotiable and establish accreditation agencies for warehouse registration. A few large national-level players like National Bulk Handling Corporation Ltd., National Collateral Management Services Ltd., AdaniAgri Logistics, Star Agri Warehousing & Collateral Management Ltd., Shree Shubham Logistics Ltd., Ruchi Infrastructure Ltd., Guru Warehousing Corporation, Paras Warehousing and LTC Commercial have entered, who are working as service provider in agri-warehousing. Let us remember that the organised warehousing sector is providing not only warehousing services but value added services to different groups of customers like farmers, traders, mill owners, banks, exporters and end industries' users.

## 11. Focus on infrastructure

Warehousing sector has been accorded the status of Infrastructure in the union budget 2018.Agri export zones are being established to facilitate agri-business.

## 12. Foreign direct investment

Foreign Direct Investment (FDI) to the extent of 100 percent is allowed under automatic

route in storage and warehousing including cold storages. This is a positive signal for growth of warehousing.

## INTEXT QUESTIONS 15.2

1. Evaluation of service providers helps in ensuring efficient services to the best satisfaction of its customers. ———True/False.

2. Urbanisation, changing lifestyle, higher industrial production creates more demand for warehouse space. ———True/False.

3. GST has no role in realignment of logistics services including demand for warehousing space. ———True/False.

## 15.4 TYPES OF INFRA-STRUCTURE OF WAREHOUSES

There is a great deal of structural and functional diversity in the warehousing systems. Different types of agri.-produce warehouse systems are discussed as under –

1. **Conventional warehouses** – These are the most common type of warehouses in the form of godowns used for storing dry cargo under ambient conditions. There are many innovations introduced in these warehouses viz. use of translucent roof sheets for better illumination, Use of Self-supporting truss-less roofing, use of pre-painted, poly-coated galvalume sheets in place of asbestos sheets, automated doors, turbo ventilators on the rooftop, solar rooftop panels etc. The roofing of the warehouse is constructed on top of steel trusses and the roofing material is appropriately chosen to avoid quick heating/cooling which can directly impact the commodities and the atmosphere inside the warehouse. Parts of the roofing are fitted with translucent sheets to have adequate light inside the warehouse during the day.

2. **Pre-Engineered Buildings (PEBs)** – These kinds of warehouses are structures engineered in a factory and assembled at the site of the unit. These are generally steel structures assembled with bolted connections.

3. **Silo** – These are bulk storage structures in the form of vertical or horizontal storage structures made of steel or concrete and cylindrical or other shapes.

4. **Silo Bag Storage** - This is hermetic storage in the form of the tubular underground airtight bag from which most oxygen ($O_2$) is expelled by the bagging machine during grain filling process, increasing pressure and compaction.Due to respiration of grains, insects, microorganisms oxygen is further depleted and level of Carbon Dioxide ($CO_2$) goes up. This creates a Modified Atmosphere which stops the metabolic



process of grains and inhibits the growth and development of moulds & insects, creating a naturally safe environment for storage.

5. **Vacuum processed storage (VPS) –** Grains are filled in airtight bid sized sacks from which air is sucked out and sealed. A vacuum is created inside which would ensure a longer shelf life of grains and help easy handling and storage of these vacuum packs at any place.

Apart from the technological innovations in warehouse structure, there are many systems wherein new technology has the potential to bring in higher efficiency. These may be briefly discussed as under:

6. **Safety and security –** Conventionally a boundary wall, proper entry gate, godowns with stronger doors with good locking system and a team of security guards constitute the warehouse security system. However, CCTV surveillance is gaining popularity as it provides a view of multi-locations in the premises even on the mobile phone with a system of alert for any unauthorised entry. There are also gazettes in the form of smart cards, fingerprint readers, iris scanners etc. which allow entry to only authorised persons in the warehouse premises. Technologies are also available to track the visitors' movements in premises based on the chip-enabled visitor badges. Smart night lighting arrangement in the premises also helps in night surveillance.

7. **Weighment infrastructure –** Generally the bigger warehouses have a weighbridge which may be mechanical or electronic, whereas smaller warehouses possess platform scales (mechanical or digital) of reasonable capacity. Now technology options are available to integrate the weighbridges or platform scales with the computerised operational management application of the warehouse.

8. **Quality testing technology –** Automation of quality testing technology includes the use of auto samplers, a variety of electronic moisture metres, automated systems for testing physical quality (using image scanning technology) and chemical parameters of the quality of agricultural produce in the warehouses.

9. **Technologies to support preservation –** there are innovative tools for automated pesticide application and safety systems, phosphine generators and application systems for large scale grain fumigation and fumigant auto monitors which greatly improve the efficiency and effectiveness of various treatments to preserve the stock during warehousing.

10. **Material Handling and Storage Systems –** The modern warehouses have done away with manual handling of goods which always have issues with respect to efficiency and speed. Particularly, the packaging and handling system has got many technology options effectively integrated with warehouse operations.

### General issues

- The warehouse should be constructed to provide scientific storage.
- Necessary approval from State Licensing Authorities must be obtained.
- The warehouse should have either facilities for sampling and grading of the commodities or a tie up with some approved laboratory.
- The equipment and items requiring calibration should be got calibrated timely from some approved calibration laboratories/ institutions
- Warehouses shall have an adequate number of Fire Fighting Extinguishers of appropriate type, fire buckets with sand and water.
- All the electrical connections and fittings should be checked and tested regularly to ensure that no electrical line/fitting is defective.
- Warehouse officials shall ensure that all the walls, pillars, partitions, ceilings, staircases inside the warehouse are white washed at defined intervals (once in 3 years).

## 15.5 IMPORTANT EQUIPMENTS REQUIRED IN TRADITIONAL WAREHOUSES

The warehouse should have necessary equipment and other items required for physical analysis and general operations.

### A. Fixtures/furniture in a physical analysis laboratory.

- Analysis table (with drawers)
- Balance table (with drawers)
- Almirah (for keeping of samples)
- Glass slabs / polished stone e.g. granite slabs
- Laboratory rack, Stools, Chairs

### B. Equipment

- Physical / Electronic balance
- Moisture metre
- Sieve Set
- Enamel plates with clean white surface
- Sample bags/ sample tags



- Bag trier/ Parkhi
- Magnifying glass
- Hygrometer
- Petri dishes
- Measuring cylinders 10 ml, 20 ml, 50 ml, 100 ml
- Borner sample divider
- Verniercalipers

### C. Disinfection equipment

- Rat cages
- Foot sprayer/Power sprayer
- Sand snakes.
- Fumigation covers

### D. Safety Equipment

- Gum boots, goggles, aprons etc.
- Hand gloves.
- Gas mask
- Phosphine gas monitor.
- Phosphine alert personal monitor
- First Aid box

### E. Dunnage materials

- Polythene film
- Bamboo mats
- Wooden crates/poly crates.

### F. Miscellaneous equipments

- Tarpaulin
- Ladder
- Weighing equipment.
- Firefighting equipment.

## INTEXT QUESTIONS 15.3

1. _____ higher returns to farmers and better services (quality) to the consumers.

2. The equipment and items requiring calibration should be got _____. from approved calibration laboratories/ institutions and necessary _____ be maintained.

3. The overall performance of the warehouse depends upon the _____ provided to its customers either directly or through service providers.

4. Conventional warehouses are to be constructed as per _____ of BIS.

## 15.6 NEGOTIABLE WAREHOUSE RECEIPT SYSTEM

Before enactment of the Warehousing Development and Regulations Act, 2007 the non–negotiable warehousing receipts did not enjoy the trust of depositors and banks. Banks and financial institutions were apprehensive of not being able to recover the loans in the events, such as fraud, or mismanagement on behalf of the warehouse or insolvency of depositors as available legal remedies were also time-consuming and inadequate. Uniformity was not there even in the format of warehouse receipts used in the country leading to lot of confusion to banking institutions

Enactment of the Warehousing (Development and Regulation) Act, 2007 has created an enabling regulatory environment for ensuring full negotiability to the warehouse receipts issued by warehouses registered and regulated by the WDRA.

### 15.6.1. Negotiable warehouse receipt vs. Non- negotiable warehouse receipt

Negotiable Warehouse Receipt as its name signifies is a receipt which can be negotiated for delivery, transfer of goods or pledge financing against the underlying goods. The major differences between a negotiable and non-negotiable warehouse receipts are as under-

1. Negotiable Warehouse Receipts truly represent a document of title to goods whereas it is not true for non-negotiable warehouse receipts.

2. Negotiable Warehouse Receipts enjoy the trust of depositors and banks whereas it is not true for non-negotiable warehouse receipts.

3. Negotiable Warehouse Receipts are transferable by endorsement whereas non-negotiable warehouse receipts are not transferable.



4. Negotiable Warehouse Receipts is safe for the banking institutions for recovery of the loans as per provisions under the Warehousing (Development and Regulation) Act, 2007 and rules and regulations framed there under but in case of non-negotiable warehouse receipts there is a risk to banks of not being able to recover the loans in event of fraud, non- payment, damage to the goods pledged, etc.

5. The Negotiable Warehouse Receipts issued under WDRA has provisions for resolution of grievances and complaints against the regulated warehouses but the available legal remedies in case of non-negotiable warehouse receipts are time consuming and inadequate.

6. The Negotiable Warehouse Receipts issued under WDRA are in uniform format across the country but it is not so in case of non-negotiable warehouse receipts.

7. The Negotiable Warehouse Receipts are having a regulatory back up to establish negotiability under the provisions of the Warehousing (Development and Regulation) Act, 2007 but it is not so in case of non-negotiable warehouse receipts.

### 15.6.2. Benefits Offered By Negotiable Warehousing Receipts

The Negotiable Warehouse Receipts offer a number of benefits to the depositors and other stakeholders as briefed below-

- Increased liquidity in rural areas for farmers.
- Encouragement of scientific warehousing of goods.
- Lower cost of financing by banks.
- Shorter and more efficient supply chains.
- Facilitates orderly marketing by indicating quality standards/grades of the underlying commodities.
- Enhanced rewards for grading and quality.
- Better price risk management by farmers.
- Higher returns to farmers and better services (quality) to the consumers.
- Avoid distress sale of agricultural produce by farmers during peak marketing season.
- Increased credibility of the warehouse due to higher trust of depositors, banks and other stakeholders.

## INTEXT QUESTIONS 15.4

1. Negotiable Warehouse Receipts offer a number of benefits to the depositors-

   a. Increased liquidity in rural areas for farmers.

   b. Lower cost of financing by banks.

   c. Shorter and more efficient supply chains.

   d. All of the above.

## WHAT YOU HAVE LEARNT


**BASED ON MANAGEMENT-** Public warehouses, Private warehouses, Cooperative warehouses, Management Warehouses

**BASED ON OPERATIONS-** Government, Private, Bonded, ContainerFreight Stations

**BASED ON WAREHOUSE INFRASTRUCTURE -** Conventional, cold storage, Controlled Atmosphere Storage, silos, tank storage.,Multi-storey warehouses, Automated warehouses

**BASED ON EFFECTIVE CONTROL-** Owned, Leased

**KEY FACTORS FOR PROMOTING WAREHOUSING-** Increase in agri. Production, industrial growth, Value added services and global competition, Foreign direct investment. Focus on infrastructure

**BENEFITS OF NEGOTIABLE WAREHOUSE RECEIPT-**

- Increased liquidity
- Scientific warehousing
- Efficient supply chains.
- Better price risk management.
- Higher returns to farmers and consumers.

**SERVICE PROVIDERS-** Handling, transportation, weighing, insect/pest control, assaying / testing of the quality of goods deposited, security and other services



## KEY TERMS

Container Freight Stations | Public warehouses | Private warehouses

Risk management | Silos | Service providers

Supply chain

## TERMINAL EXERCISE

1. Public Warehouses are run to store goods of the general public. **True /false**
2. Cooperative Warehouses are small capacity warehouses owned, managed, and controlled by private parties. **True /false**
3. Private sector warehouses can also be public or private warehouses. **True /false**
4 A successful multi-storeyed warehouse has to be integrated with a great degree of mechanisation and automation. **True /false**
5 Cold storage can also be used for dry cargo. **True /false**
6. What is the difference between a bonded warehouse and a cooperative warehouse?
7. What is the basic difference between a public and a private warehouse?
8. What you understand from Container Freight Stations (CFS)/Inland Container Depots (ICDs).
9. What are the key differences between a cold storage and controlled atmosphere storage?
10. What is silo and what is the purpose of building silos?
11. Why do we need tank storages?
12. What is the difference between a leased and a sub leased warehouse?
13. Name 5 important parameters required monitoring performance of service providers?
14. What are key factors in promoting warehousing?
15. What is Vacuum processed storage (VPS)?
16. Explain different types of infra -structure in warehouses?

17. Discuss in detail the benefits of Negotiable Warehouse receipt system .What are major differences between a negotiable and non-negotiable warehouse receipts.

18. Discuss different types of warehouses based on type of management and operations.

19. What are conventional warehouses, what parameters are helpful in setting up a good warehouse?

## ANSWERS TO INTEXT QUESTIONS

**15.1**

1. d  2.d  3.c.  4. d  5, d

**15.2**

1. True
2. True
3. False

**15.3**

1. warehouses
2. Calibration
3. Quality of service
4. IS; 16144 (2011)

**15.4**

1. d

## DO AND LEARN

Make a comparative statement of the functions of a store and a warehouse. How does a store different from a warehouse?

16

# WAREHOUSE ORGANISATION STRUCTURE - ROLES AND RESPONSIBILITIES

In the previous lesson, you learned about the types of warehouses i.e. government, private, bonded. In this lesson we shall discuss warehouse Organisation structure and roles and responsibilities. In any business or trading activity warehouses are important tools for arrange supply of physical products from the producer or manufacturer to consumers. The warehouses must to ensure that goods are received promptly, accounted for accurately and stored safely until the deposit liquidate them. In this chapter students will understand that the warehouse Organisation structure depends on the type of services, type of commodities, capacity of the warehouse and customer requirements.

## LEARNING OUTCOMES

After studying this lesson the learner:

- identifies the duties and responsibilities of warehouseman;
- analyzes importance of maintaining records for efficient warehousing;
- explains different handling operations in warehousing;
- summarizes the applications of technology in warehouse management;
- lists safety and security requirements in warehousing.

## 16.1 MANPOWER REQUIREMENT

Before we work on manpower requirements, we need to understand its activities. Following key functions are required to be performed in the warehouse:

- Management and control of the warehouse

- Maintenance of various records at strategic points
- Supervising the transactions
- Quality assessment, monitoring and various quality-related operations
- Safety and security of goods and premises
- Weighing of stock
- Finance related work
- Mechanics for any mechanised operation.

### 16.1.1 Job Description of Different Categories of Staff in a Standard Warehouse

Generally the warehouse requires various categories of staff based on the type of operations to be handled directly or by outsourcing to service providers. The key functionaries are as follows:

- Warehouse manager.
- Quality supervisor/assistant.
- Warehouse Assistant
- Security Guards

The job description of each cadre is briefed as under-

**A. Warehouse Manager:** A warehouse manager has a lot of responsibilities as in charge of the warehouse, to oversee both employees and physical goods**,** which include:

a. Manage the warehouse in line with company's laid down procedures/ standards and to ensure adequate supervision over the entire operations undertaken at the warehouse by the concerned staff.

b. Monitoring closely basic operations, such as receiving, warehousing, distribution, safety & security of the stocks and scientific preservation of stocks, up to date maintenance of records insurance of stocks, judicious use of the equipment, fumigants and other property of the warehouse.

c. To effectively liaise with various stakeholders of the warehouse such as depositors, banks, service providers, local administration etc.

d. To make sincere efforts for maximum utilisation of warehouse space, to customer.



e. Maintain standards of health and safety, hygiene, and security by conduting periodic and surprise checks.

f. To supervise the staff to maintain proper discipline and to ensure that there is complete cohesion and harmony among the staff as will as to inculcate team spirit, cooperation and ensure the entire staff working at the warehouse.

g. In case of emergency, to exercise overall vigilance and exhibit due presence of mind in order to safeguard worehouse operations by following security procedures.

h. To bring new customers to the warehouse.

i. To provide required returns about all transactions (receipt, delivery) and detailed inventory to customers as per their requirement.

j. To exercise administrative and financial powers as prescribed from time to time.

## B. Quality Supervisor / Technical Assistant

a. To draw samples for analysis of stocks received in the warehouse and ensure proper storage and maintenance of reference samples and related records.

b. To analyze and grade of stock received in the warehouse. Check for any violations of the FSSAI Standards.

c. To undertake regular stock health inspection at regular intervals.

d. To undertake regular prophylactic treatment through appropriate chemicals at the desired dosage and frequency.

e. To perform curative treatment (fumigation) of stocks for effective insect infestation control.

f. To ensure proper shed hygiene and sanitation at all times.

g. To undertake physical verification of stocks stored in the warehouse.

h. To check the quality of stock at the time of issue vis a vis the reference sample.

i. Perform regular checks and monitoring of various equipment and machinery and keep them in proper working condition

## C. Warehouse Assistant

a. To supervise a measurement of stock through different modes during receipt, delivery and other warehouse operations.

b. After checking that the right quantity and types of goods have been delivered and recieved, supervise the loading and unloading of the stocks from the trucks/ carrying vehicles.

c. To sign the delivery form, once satisfied that the stocks are complete.

d. To supervise the movement and stacking of the stocks to the correct area in the warehouse as per the approved stack plan.

e. To keep records of stocks received, delivered and in storage with respect to their location and quantity.

f. To arrange the-stacking of goods for delivery to depositors.

g. To keep a record of internal stocks shifting.

h. To prepare daily transaction reports for godowns under his charge.

i. To assist in assessing the storage charges due and collection of the same from the depositor.

j. To assist the warehouse manager in the financial management of the warehouse.

## D. Security Guards

a. To watch over and protect the warehouse against various threats, including vandalism, theft, illegal activity and terrorism.

b. To thoroughly check the transport vehicle for the presence of any extraneous material such as stones etc. which may be used for manipulating the quantity of stock deposited in the warehouse.

c. To check the condition of locks in the godowns and take note of/report any damages to the same.

d. To survey various locations in the warehouse premises (use closed-circuit TV monitors if available in the warehouse), take note of risk-based happenings and report to the Warehouse Manager/ designated officials.

e. If any security risks/incidents are mentioned in the handover report to the next security guard they should be properly recorded.

f. To familiarise with the operation of different types of fire -fighting equipment deployed in the warehouse.



### 16.1.2 Requirement of Staff Based On Capacity

Manpower requirement is not static but decided based on commercial transactions and technical considerations. It is however necessary that the personnel selected for warehouse operations have adequate knowledge and expertise in the scientific storage of different goods/agricultural commodities. This is to be accepted for storage in the warehouse. Various institutes like Indian Grain Storage Management and Research Institute (IGMRI), Department of Food and Public Distribution, Government of India, NIAM, Jaipur, FCI, CWC, SWCs, WDRA, MANAGE Hyderabad are providing training on quality control and warehousing.

Efforts are made to provide adequate training to selected manpower from these institutes or any other government institutes, to imrove operational efficiency. The minimum requirement for manpower based on the warehouse capacity as suggested by WDRA, is given below: (***Table: 16.1***)

***Table: 16.1*** **Staffing norms as per WDRA**

| Storage Capacity of Warehouse (M.T.) | Upto 5000 | 5001-10000 | 10001-25000 | Above 25000 |
|---|---|---|---|---|
| Warehouse Manager | 1 | 1 | 1 | 1 |
| Technical Asst./ Jr. technical Asst. | 1 | 1 | 2 | 3 |
| Warehouse Asst. | 1 | 2 | 4 | 5 |
| Security Guards | 4 | 4 | 6 | 8 |
| **Total** | **7** | **8** | **13** | **17** |

## 16.2 OBLIGATIONS AND RIGHTS OF WAREHOUSEMAN

### 16.2.1 Obligations of warehouseman

1. Warehouseman is bound to take as much care of goods entrusted to him as a man of ordinary prudence would, under similar circumstances and conditions, take of his own goods of the same type and value.

2. Warehouseman is bound, except for a lawful excuse, to deliver the goods on demand made by the depositor. This is subject to surrender of the warehouse receipt, payment of storage charges and other dues of the warehouseman and acknowledgement of delivery of the goods.

3. Warehouseman is liable to deliver the goods according to the original tenor of the warehouse receipt even if it is altered subsequently without any authority.

4. Warehouseman may deliver part of the goods at his discretion if required by the depositor. When, part delivery of the goods is made for which a negotiable warehouse receipt has been issued, the warehouseman shall make a statement on the warehouse receipt giving particulars of the goods which have been delivered.

5. Warehouseman is liable for the value of the goods to the depositor or to the holder of a warehouse receipt in due course for the non-existence of the goods or the goods not corresponding with the description given in the warehouse receipt at the time of issue.

6. The liability of a warehouseman in the case of loss, destruction or damage to goods while in his custody is limited to the value of the goods on the date of their deposit in the warehouse.

7. Warehousemen may store fungible goods with other similar goods of some kind and grade with the depositor's consent.

8. Each warehouse receipt must be arranged to allow easy identification and delivery of the goods when required by the depositor without undue delay and handling.

9. If the warehouseman is satisfied that any lot of goods will deteriorate in value or injure other property, he is required to give notice to the depositor. This notice requires him to satisfy the lien upon the goods and remove them from the warehouse.

10. To supply a certificate if requested by a depositor on payment of the prescribed fee. This will indicate the condition of his goods stored in the warehouse.

11. None other than the depositor can claim right over any increase in weight of accepted goods due to moisture absorption.

### 16.2.2 Rights of warehouseman

1. Warehouseman is not responsible for any loss, destruction, damage or deterioration of the goods delivered to him for storage which arises from force majeure, act of public enemies, attachment of seizure under legal process, natural deterioration, shrinkage or loss in bulk or weight due to inherent or latent defects in the quality of goods or packages and such other unforeseen reasons as are not specifically covered by insurance.

2. The goods covered by a warehouse receipt and in the possession of a warehouseman may not be attached in execution except by seizure of the warehouse receipt or by lawful process, relating to the goods.



3. Warehouseman holds a statutory lien on the goods and also on the sale proceeds of such goods. This lien is to recover his charges for storage, preservation, handling and sale of goods by auction or disposal of goods where so required. If the goods are sold or disposed of after following the prescribed procedure, the warehouseman cannot be called upon to deliver the goods to the depositor.

4. Warehousemen may refuse to deliver the goods to the person demanding delivery of until his lien is satisfied.

5. Warehouseman may realise his warehouse charges by sale of the goods. This is after giving written notice to the depositor and to other persons who have some interest in the goods.

6. Even when not required under law, the warehouseman may insure the goods against risks of fire, theft, floods and other risks. In the event of doing so, collect insurance cost from the depositor.

7. Warehousemen may decline to accept goods which are likely to cause injury, damage or deterioration to other goods in storage. This is without them being first reconditioned and made fit for storage by the depositor at his cost.

8. Warehousemen cannot be called upon to deliver the goods except during normal working hours. He be required to deliver the goods to a place other than the warehouse.

9. Warehousemen may dispose of by public auction or otherwise the goods that cannot stand further storage or are likely to damage or injure other goods in storage. This is the same are not lifted by the depositor on being instructed to do so by the warehouseman.

10. Warehouseman may require the depositor to make a pallah of the goods at his cost to ensure quality uniformity before storage. He may also shift the goods from one godown to another godown if considered necessary for proper preservation of the same. He may also recover the expenses from the depositor.

11. If there is any driage, shrinkage or loss in weight in the goods stored in the warehouse on account of evaporation of moisture or other causes beyond the control of the warehouseman, he cannot be made liable for the same.

### 16.2.3 Requirements from licensed warehouseman

1. Exhibited in a prominent place in the warehouse the licence granted to him for warehousing. The licence is required to be renewed every year and can be revoked or canceled by the licensing authority. This is for reasons to be specified by him in writing.

2. Display in bold letters the warehouse working hours to indicate when the goods can be deposited, received and delivered.

3. Exhibit conspicuously a copy of his current rules and approved schedule of charges along with a translation in the local language.

4. Accept goods on a *'first come-first served'* basis and not show undue preference to any one. However, he may levy such charges for storage as may be agreed upon between him and the depositors. This is subject to the limits, if any, prescribed by the licensing authority.

5. Warehouseman is prohibited, either on his own account or that of others, to deal in or lend money on the goods he receives in his warehouse.

6. If the warehouse receipt is lost, destroyed, torn, defaced or otherwise becomes illegible, the warehouseman is required to issue a duplicate warehouse receipt. This is the manner prescribed for the purpose.

7. Exercise such care in keeping distinct the produce of each depositor as will enable him at all times to identify it and deliver it without undue delay. Goods of different classes or grades or qualities shall normally be stored separately.

8. In the event of any fire or loss or damage to goods stored in the warehouse, the warehouseman is required to inform the depositor and the prescribed authority of the same.

9. To maintain a system of accounts as approved by the prescribed authority for the purpose and keep all records, books and papers in a safe place.

10. To submit to the prescribed authority, from time to time, such reports as are required by him with regard to the warehouse business.

## INTEXT QUESTIONS 16.1

1. Manpower requirement in the warehouse should be determined based on-

   a. Commercial transactions

   b. Technical considerations.

   c. Capacity of depot.

   d. All of the above.



2. Warehouseman is bound, except for a lawful excuse, to deliver the goods;

   a. On demand made by the depositor

   b. Subject to surrender of the warehouse receipt,

   c. Payment of storage charges.

   d. All of the above.

3. The main activity of the warehouse includes:

   a) Quality assessment, monitoring and various quality-related operations

   b) Safety and security of goods and premises

   c) Maintenance of various records

   d) All of the above

4. Part delivery of the goods hypothecated with the banks to the specified extent can be done by the warehouseman after clearance from the bank. - True/ False

## 16.3 RECORD MANAGEMENT

Warehouse companies, generally, devise a standard operating procedure (SOP) for documenting the sub-activities undertaken at the warehouse level during deposit and/or withdrawal of commodities. These SOP are in the form of various Forms and Formats used for recording the "Transactional Details" involved in the process of physical transactions of deposits and withdrawal of the commodity from warehouse and normally are applicable in all lease, franchise, stock management and lease franchise type of warehousing arrangements at all storage locations. A summary of some of the forms, formats and registers used for recording standard operating procedures is provided below:

### A. Forms/ Registers

- Application for deposit of commodity and its components.
- Commodities withdrawal application form and its essentials.
- Day truck transaction report – mandatory capturing of information.
- Monthly warehouse activity report on quantity, quality and related activities.
- Warehouse supervisor – dairy and weekly progress report.



- Warehouse access register – controlling access to storage area during inward and outward movement of commodity and quality preservation activities.
- Daily Truck Transaction Register cum Asset Tracker (two-in-one register)

## B. Forms & Formats

### a. Application for Commodity Deposit

Whenever a client is interested in deposit his stock in any warehouse, a deposit application for the commodity to be deposited is required to be submitted to the warehouse manager. The deposit document consists of the following points:

- Name of the commodity
- Complete description of the commodity with its grade or quality
- Declaration about number of packages and likely quantity to be stored
- Declaration with reference to distinguishing marks, if any
- Declaration about packing material and total weight of the consignment.
- Depositor has to specify whether the commodity deposits shall be done by him or by his agent.
- Depositor has to declare that the goods mentioned in the application form are his / her bona fide property and no other person has a claim against them.
- Depositor / agent has to declare the full name and address of the owner of goods / depositor / agent along with the contact telephone number.
- For future records, the depositor must have provide duly verified photo identification proof of himself or his agent. Attestation of specimen signature cards can be organised through the bank/ notary manager.
- Duly filled and signed (with seal) application form should be submitted by the owner /depositor of the commodity to the warehouse manager prior to bringing in the commodity to the warehouse. The warehouse manager will keep it in his records for future reference and for of internal and external audits.

## C. Gate Pass

At the entrance to the warehouse, the waybill is collected from the driver whenever a loaded truck enters the warehouse premises. At the time of exit of the truck, a gate pass issued by godown staff to the driver is verified and copy retained by the security staff. At



both entry and exit security enters all details regarding the carrgo and the truck in the Gate Register.

### D. Sample Slip

- Samples drawn from the stack should be placed in sample bags for analysis and grading. Details of the sample are recorded in a sample slip and get authenticated by the depositor/his authorised representative.
- Maintain a file of sample slips at the warehouse and enter the details in the appropriate module of Stock Accounting Software of the warehouse company.

### E. Withdrawal of Commodities

The procedure for withdrawal of stocks from the warehouse for deposits not having availed any funding against commodity, is as mentioned below –

- Collect original warehouse receipt from client
- Collect warehouse charges as per book of entries
- Prepare the ad-hoc invoice and cash receipt
- Deposit the cash/cheque in the designated bank
- Release the commodity
- Print the system generated withdrawal document and obtain the client's signature and handover.

The procedure for withdrawal of stocks from the warehouse for deposits not having availed funding against commodity, is as mentioned below –

- Collect original pledge release document issued by the bank.
- Make withdrawal entry in Stock Accounting Software of the warehousing company.
- Print the system generated withdrawal document and release the stock.

### F. General instruction on record management

Some of the general instructions required by warehousemen for efficient warehousing operations and record management are as provided below -

- The warehouse manager records all the details at all times with reference to



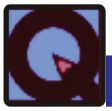
every transaction of deposit and withdrawal of commodity/ goods transacted from the warehouse. This is done manually in prescribed registers of the warehousing company as well as in stock accounting software of the company, if provided.

- During all times the warehouse manager must record on the form under his signature and collect the counters signature of the depositor/ authorised signature.
- The warehouse manager is required to complete all entries and submit them for further correct replication into the warehouses electronic software as defined in the procedure.
- All deposits/withdrawals moving in/out of a warehouse to be maintained in the prescribed form (like DTS-Daily Transaction Slip) with information on depositor, agent/ supplier, commodity, packaging material (jute/plastic), carrier details, warehousing company gate pass no., weighbridge details and general quality parameters, etc.
- The transactional details are recorded in three copies, namely original and two duplicate (carbon) copies. The original is handed over to the depositor or his authorised representative at the completion of physical transactions at the warehouse. The carbon copy is provided to the warehousing company's local office for its entry into the stock accounting software while the second carbon copy is retained and maintained at the warehouse level with the warehouse manager for his stock accounting activities as well as for internal and external audits in the future.
- Warehouse manager is required to undertake periodic reconciliation of physical stocks with his warehouse records as well as cross checking of entries in the stock accounting system. This is for maintaining accurate inventory records at all times.
- Warehouseman is required to fill in a Daily/ Weekly/ Monthly warehouse activity report in a chronological manner, date-wise to maintain the sanctity of record keeping under good book keeping practices without any blanks/spaces and cutting or overwriting. Spillages in the godown need to be collected, cleaned, filled in pallah bags and accounted for properly.
- Details pertaining to opening balance, deposits, withdrawal, and spillage/made up bags and other quality issues, if any, should be in clear numbers (weight, number of bags) and should strictly be date wise.
- All the activities related to preserving warehouses stocks viz. A warehouse spraying



and fumigation need to be tracked in sequential order, while capturing accurate information about manpower and other resources (chemicals, machine, etc.).

- Date-wise details of temporary/ casual labourers hired for warehouse cleaning/other operations.
- Date-wise details of security deployment in terms of number of guards, duty shift details like day and/or night or first, second or third shift with details of relievers/ roasters and number of days present.
- Preparation of a monthly warehouse activity report is the base document for recording all the transactions/ activities undertaken at a warehouse during a particular period. The correctness of each entry is of the utmost importance. Any lapses in the same may result in incorrect stock accounting and preparation of incorrect income and expense statements for the said period.



## INTEXT QUESTIONS 16.2

1. The process which is a part of SOP is:

   a. Deposit and Delivery

   b. Storage

   c. Risk Management

   d. All of the above.

2. Acceptance of damaged stocks in the warehouse can be:

   a. Done after reconditioning at the cost of the depositor.

   b. Done after reconditioning by warehouse at its cost.

   c. Can be denied

   d. None of these.

3. Pala bags are used in food-grain godowns:

   a. to fill sound grains at the time of receipt.

   b. to fill sound grains at the time of delivery.

   c. to fill spilled grains in the godown.

   d. None of these.

## 16.4 TECHNOLOGIES CONCERNING THE MANAGEMENT OF WAREHOUSE OPERATIONS

Today's warehouses are driven by the information technology revolution. Massive integration of IT systems with various warehouse operations has greatly contributed to the efficiency, speed and accuracy of various warehouse transactions. These systems may be elaborated as follows:

**A. Warehouse management systems (WMS) -** The Warehouse Management System (WMS) is a complete warehouse operation application developed on a suitable software platform which capture various transactions during deposit, storage and delivery of warehoused goods. A WMS facilitates tracking inventory, transactions and data about the goods stored by providing a complete audit trail of various operations. Integration of WMS with the electronic Negotiable Warehouse Receipt (e-NWR) repositories makes the entire warehouse operations safe and secure thus resulting in greater customer satisfaction.

**B. Automated Storage and retrieval systems -** Automated storage and retrieval systems (AS/RS) are computer- and robot-aided systems which help in quick recovery of goods from specified locations in the warehouse. These involve digitization of both floor/vertical space in the warehouse, channels for material handling systems movement and suitable computer application to manage the same. The goods are automatically moved to bins, shelves or other predefined storage location depending on their size, number of units and the volume. In addition, they are automatically moved to the availability of slots in the warehouse space. The handling machinery is either crane mounted, or robot enabled to facilitate carrying the goods to a specified location. It retrieve items or store them in specific locations.

**a. Benefits of Automation**

- Quick movement with accuracy.
- Reduced labour cost
- Least damage to packages
- The lesser risk to manpower
- Easy handling under different situations.
- Better space utilisation.

**C. Tracking and tracing solutions –** In order to ensure the safety of goods in the



warehouse, it is imperative to important a system for tracking and tracing the movement of packages in the warehouse and outside. While warehouse management applications like Real Time Warehouse Control Systems (RTWCS) and Computer Integrated Warehousing (CIW) solutions facilitate proper tracking of the position of various packages in the warehouse, there are some specific applications like Bar Coding, Quick response (QR) coding and Radio-Frequency Identification Devices (RFID) which serve the purpose.

## INTEXT QUESTIONS 16.3

**Fill in the blanks**

1. Automated storage and retrieval systems (AS/RS) are computer- and robot-aided systems that help in quick ——————from specified locations in the warehouse.

2. ——————is a complete warehouse operation application developed on a suitable software platform. It has provisions to capture various transactions during deposit, storage and delivery of the warehoused goods.

## 16.5 SAFETY AND SECURITY OF AGRICULTURAL PRODUCE

### A. Accepting Stock

When agricultural produce is revieved in the warehouse for storage, it must be carefully inspected. In case of bag storage special attention needs to be given to identification of slack, torn, wet and damp bags.

### B. Action points

- Slack bags to be filled to standard weight.
- Torn bags need to be stitched or replaced to avoid further grain spilling.
- Damp or wet bags have to be opened out and grain needs to be dried and earmarked and stacked separately for early disposal. In no case should damp or wet bags to allowed to go into a regular stack.
- Infested bags need to be stored in an isolation shed wherever possible or away from pest free stocks and fumigated immediately.

- Damaged stocks should not be accepted in the warehouse until they are reconditioned and conform to quality parameters.
- In case of grain being dried in the sun, it should be allowed to cool down before being re-bagged and stored.
- Representative samples of 2 kg are drawn from each lot of the appropriate size. This is called a 'composite' or 'bulk' sample. It shall be examined for the general stocks condition, infestation, admixture and impurities. The composite sample is divided into 4 parts and 500 grams are analysised. The stocks are classified and categorized to know the level of infestation and stock condition respectively. The stocks are also graded based on the Agricultural Produce (Grading and Marking) Act 1937. The observations are required to be captured in the Analysis and Grading register, stack card and in stock-inward-reports, which is to be duly acknowledged by the representative of the depositor for its final impression on "Warehouse Receipt" issued by the warehouse for the said stock.

As a routine measure, agriculture produced on receipt in the warehouse needs prophylactic treatment as per prescribed drill. Moisture content of the incoming produce needs to be determined and recorded in the relevant registers and records. This must be duly authenticated by the depositor or his authorized representative.

## C. General Precautions

It is important to understand the compatibility of different commodities brought to the warehouse for storage. It is not advisable to store incompatible commodities together to avoid contamination as briefed below-

- Grains and pulses are required to be kept separately.
- Stocks of fertilizers, pesticides and other industrial products like cement should not be kept along with agricultural produce like wheat / paddy / pulses / oilseed within the same storage space.
- Hygroscopic commodities (commodities that absorb atmospheric moisture) like sugar must be kept separately.
- Storage of cotton bales identified as hazardous commodities is preferred in separate chambers in warehouses and not with food grains.
- Spices also require separate chambers to avoid loss of the original aroma contamination.
- Similarly other soft grains like Maize, Jowar, Bajra Sorgum, etc. are more susceptible to increased insect and fungal infestation and microbial damage and therefore call for additional attention during storage.



- Milled products such as Atta, Maida and Suji being more susceptible to atmospheric moisture and insect infestation damage require special attention.
- It should be labelled as "Damaged" and kept separately if damaged stock/grain has been received or identified after salvaging/reconditioning.

### Procedure for reconditioning or salvaging operation

Deteriorated and damaged grains received in any warehouse should be treated or reconditioned expeditiously to avoid decomposition of wet stocks and to avoid complete loss of value as per procedure given below-

- Cutting open bags and separating out sound stock from damaged stocks (grains, kernel).
- Spreading of damaged kernels in a thin layer for aeration and drying.
- Where necessary, the grain needs to be passed through a mesh and sieve of appreciated size to clean/ segregate of foreign matter.
- As soon as sound produced/grain is received, it should be re-bagged in separate gunny bags for routine disposal through normal/ other good stocks in the warehouse. The damaged portion of commodity/ grain must be traspoted to the isolation shed of the recording its weight and expenses. For necessary stock accounting and financial accounting formalities before its final disposal at reduced commodity price. This is as per the prescribed accounting standards of the warehousing company.

## 16.6 WAREHOUSE SECURITY MANAGEMENT

Security risks could be from both internal and external sources. Internal threats could be caused by own employees and third parties hired by the Organisation, while external threats would involve anyone else who enters the warehouse without authorization with the intention of burglary, theft etc. Proper security arrangements in the warehouse are essential to avoid theft/burglary. Basic requirements include a proper locking system, installation of security gadgets, deployment of security guards, etc.

The warehouse shall have foolproof security arrangements round the clock with adequate security guards, equipped with appropriate equipment for guarding the warehouse. Security guards can be managed through service providers. Warehouse officials shall ensure that security guards are rotated as far of the possible.

### A. Training needs of security staff

Warehouse official shall ensure that security guards are adequately trained in terms of



following aspects:

- Adequate patrolling.
- Observation of doubtful activities.
- Handling of communication equipment.
- Handling of safety equipment.
- Contact details of local police, fire brigade and civic authorities to manage emergencies.

Record of entry or exit in the warehouse along with time of all vehicles/ persons be maintained. The warehouseman shall ensure that all important keys are kept in safe custody and only authorized personnel have access to withdraw the keys. Keep duplicate keys of all godowns in safe custody, preferably banks. The warehouseman shall ensure that before closing the office, the number of keys is verified and in case of any deviation, appropriate actions shall be taken.

## B. Fire Fighting System:

Warehouses are generally packed with different types of commodities which may include non-hazardous, hazardous or even extra hazardous commodities, which are prone to fire risks at all times if safety precautions are overlooked. Warehouse buildings must be constructed as per the safety code of conduct. It is the prime responsibility of the warehouse manger to in sure that all the stocks in the warehouse and available facilities are keep safe from losses due to fire hazards. All safety measures need to be meticulously followed to avoid fire outbreaks in the premises. Signage on directions, safety and relevant information to ensure disciplined and smooth movement of personnel, vehicles and materials must to be provided.

Apart from damages to stocks, emerging smoke, heat or flames from fire accidents can also cause employee injury. It is necessary to effectively mitigate warehouse fires as follows:

- Adequate fire fighting equipment as per norms.
- In case of hazardous goods storage a fire strinkler system with an adequate water storage tank required.
- Provision of fire suppression systems, such as sprinklers, fire doors, and fire extinguishers.
- Fire alarm system and fire alarm monitoring
- Emergency lighting
- The fire control procedures should be fully documented, shared publicly, and practiced regularly.



The above elements work together to protect the warehouse from fire risks. To draw fire protection plans, Warehouse equipment must be assessed by exparts based on building type, capacity and types of hazards. The capacity wise standard requirement of fire extinguishers and fire buckets for normal commodities is (***Table: 16.2***), however the requirement may be doubled in case of hazardous goods.

The warehouseman and other staff of the warehouse should be trained on the basic principles and general procedure of fire fighting in a warehouse. Warehouse officials must ensure that all fire fighting is in working condition.

***Table: 16.2*** Norms of Firefighting equipment as per CWC guidelines.

| S. No. | Capacity of the godown(MT) | No. of fire extinguishers to be provided | No. of fire buckets to be provided |
|---|---|---|---|
| 1. | Below 3000 | 3 | 15 |
| 2. | 3001-5000 | 4 | 20 |
| 3. | 5001-10000 | 6 | 30 |
| 4. | 10001-15000 | 8 | 40 |
| 5. | 15001-25000 | 10 | 50 |
| 6. | 25001-50000 | 15 | 75 |
| 7. | 50001-75000 | 25 | 125 |

## INTEXT QUESTIONS 16.4

1. Fill in the blanks

   a. _____ are responsible for watching and protecting the warehouse against various threats, including vandalism, theft, illegal activity and terrorism.

   b. Damp or wet bags received in the warehouse need to be earmarked and stacked _____for early disposal.

   c. Sampling at the time of receipt helps in _____ determination.

2. Choose a correct or incorrect statement-

   a. Fertilizers and food grains must be stored separately.

   b. Sugar and wheat stocks can be stored in the same godown.

c. No need to spend time and money on training as staff can pick up from routine working.

3. Choose the correct statement about the need for sampling of food grains.

a. Sampling is an essential part of the inspection process and is critical to the accuracy of the final grade

b. Batches of grain are rarely uniform in quality even when regarded as acceptable

c. Both a & b are correct.

d. Both a & b are incorrect.

## WHAT YOU HAVE LEARNT

**WAROHOUSE MAN** is bound to take as much care of goods entrusted to him as a man of ordinary prudence would, under similar circumstances and conditions, take of his own goods of the same type and value but not responsible for any loss, destruction, damage or deterioration of the goods due to unforeseen reasons.

ORGANISATION STRUCTUREOF WAREHOUSE

**DEPENDS ON**

- Type of services being offered,
- Type of commodities in storage,
- Capacity of the warehouse to be managed
- Requirement of customers

**REQUIREMENTS OF WAREHOUSE**
Proper equipment, Adequate strength of security guards, Regular inspection of stocks. Integration of IT system.

STANDARD OPERATING PROCEDURE (SOP) must be followed



## KEY TERMS

Liquidation of stocks — Natural deterioration

Organisation structure — Quality parameters, Security

Standard operating procedure — unforeseen reasons

## TERMINAL EXERCISE

1. What is the full form of IGMRI?
2. How many fire extinguishers are required in a warehouse with a capacity of 6000 mt?
3. Who determines the quality of stocks in the warehouse?
4. What is the full form of SOP?
5. Cotton bales are a non- hazardous commodity (True/ False).
6. Write a short note on the various functions performed by trained manpower in the warehouse?
7. Write a short note on the important duties and responsibilities of a warehouse manager?
8. What is the difference in duties of a quality assistant and warehouse assistant?
9. What do you understand from the Warehouse Management System (WMS)?
10. What are the advantages of automated storage and retrieval systems (AS/RS)?
11. List a few steps required by warehouse staff at the time of goods acceptance?
12. Briefly describe the reconditioning procedure in case of deposit of damaged food-grains in the warehouse?
13. Why do we require fortnightly inspection of food grain stocks?
14. Briefly discuss the training needs of security staff in the warehouse?
15. Why do we require fire -fighting equipment in the warehouse?
16. How records maintained in the warehouse? State why they are necessary?

17. Explain the role of safety and security of agri products in the warehousing operation starting from receipt of stocks till liquidation.

18. Discuss safety and security needs in the successful warehouses management?

19. Explain the duties and responsibilities of warehouse manager, quality assistant and warehouse assistant?

20. What happens if damaged stocks are stacked along with sound stocks? What precautions and measures are necessary to ensure safe storage?

## ANSWERS TO INTEXT QUESTIONS

**16.1**

1. d 2. d 3. d 4. a

**16.2**

1. d 2. a

**16.3**

a. recovery

b Warehouse Management System

**16.4**

1. a. Security guards b. separately c. quality

2. a. true b. false c. false

3 c

## DO AND LEARN

Imagine you are setting up a warehouse of 10000 mt capacities to store wheat, sugar and fertilizers. What type of manpower and security measures are required for successful operations particularly if you are required to receive even damaged stock.

17

# WAREHOUSE UTILIZATION MANAGEMENT

In the previous lesson, you learned about the warehouse organization structure and its roles and responsibilities. In this lesson we shall discuss warehouse utilization management (WUM) i.e., Study on emerging trends in the warehousing sector. Warehouses are a key component of the commodity supply chain, as well as a system for storing and distributing goods from production areas to consumers. In addition to saving time and money, modern technology is used in warehouses to handle goods efficiently. Mechanization and automation of agricultural produce storage systems is necessary to improve the handling and storage of agricultural produce. Different of stacking patterns are followed to keep packages on the warehouse floor.

We need to follow a standard operating procedure (SOP) for receipt / delivery of stocks to achieve customer satisfaction as effective customer service is the key to the business success. We need to switch from bag to bulk storage as soon as possible.

## LEARNING OUTCOMES

After studying this lesson the learner:

- defines the status of warehousing utilization in warehouse management;
- identifies the services offered by warehouses;
- outlines the storage space planning in warehouse utilization management;
- relates the customer expectations in warehouse utilization management;
- lists the need for an improved storage system.

## 17.1 CHANGING AND EMERGING ROLE OF THE INDIAN WAREHOUSING INDUSTRY

1. Warehouses collect the goods; sort and distribute them as a part of supply chain activity. Logistics includes inventory planning, procurement of goods, warehousing, packaging, transportation, distribution and customer service. Therefore, Warehouse is a system to assist the storage activities of different goods on a small and large scale. This is done in a systematic and orderly manner.

2. India warehouse cater are primarily catering to the agriculture sector because of record food and grain production in the last few years. The introduction of the Goods and Services Tax Regime in 2017 and the grant of the status of "infrastructure" to the logistics industry are the most significant factors in the growth of the warehousing industry in India

3. As per the recommendations of the Rural Credit Survey Committee (1954), the parliament of India passed a bill named Agricultural Produce (Development and Warehousing) Corporations Act, 1956, for setting up warehousing in the public sector and introduction of a three-tier structure consisting of Central Warehousing Corporation (CWC) for markets of national importance, State Warehousing Corporations (SWC) for state markets and cooperatives to take care of local or village markets.

4. In recent times, the introduction of Gramin Bhandaran Yojna has given the necessary push to the growth and development of agri-warehousing. This is not only in the government sector but also in the private sector. The government support to the Private Sector and Cooperatives helped create warehousing capacity across the country.

5. Various reform initiatives of the Government encouraging participation of the private sector in the creation of warehousing infrastructure helped achieve significant growth in warehousing capacity, in the post-independence period.

6. Besides agriculture, the manufacturing sector is amongst the major users of warehouse space. To aid manufacturing and warehousing sectors, the government plans to set up multimodal logistics parks at an investment of Rs 2 trillion at 34 locations across India, which is likely to have the highest freight movement.

7. Initiatives like the Make in India program, multimodal logistics parks, and infrastructural push, would together lead to a rise in development for existing warehouse space. In addition, there would be an increase in demand for existing warehouses.

8. Further, the current set of players would invest in capacity expansion, once the existing



capacity utilization of the manufacturing industry in India, which is poised around 70%, reaches at least 80–85%. Once that level of capacity utilization is crossed, the industry may witness the movement for next investment cycle.

### 17.1.1 Key Emerging Trends in Warehousing

India is still behind major economies in terms of per capita warehousing space but it is now growing faster than earlier to provide a necessary boost to our economy as briefed below-

- Gradual shift in industry structure from fragmented and unorganized players to large organized players.
- Increasing institutional investor participation and the entry of foreign players in the sector.
- Consolidation of warehouses from a large number of small facilities to a few larger centers.
- Reduction in inventory carrying costs for major companies.
- Implementation of automation and smart warehouse solutions in warehouse operations.
- Makeover of warehouses to provide storage andvalue added services.

## 17.2 SERVICES OFFERED BY WAREHOUSES

Warehousing, a key component of the commodity supply chain, comprises the facilities and systems which add value to the products. This is done by providing efficient storage and distribution of goods from the production areas to the consumers. The requirement for warehousing starts at the point of production or procurement of raw materials and when it reaches the door of customers.

Warehouses are used to store goods in a systematic and orderly manner. They protect goods against fire, flood, cyclone, storm, heat, moisture, etc. and also cut down losses due to damages. In addition to this, warehouses nowadays also render a variety of many other services. Ultimately, the use of warehousing in a business activity strengthens its overall economy. The following are the common services offered by warehouses:

A. **Storage of Surpluses and Scientific prevention-** Warehouse provides services for inventory management and acts as a balancing place for supply and demand of various goods by providing facilities for storage of seasonal products, to make their availability all-round the year or safely keeping goods produced in bulk in industries and arrange supply of the same to the consumption areas in the required time and place.

B. **Risk management –** Being a bailee of goods as per the law like the Indian Contracts

Act, the warehouses accept the responsibility of risks incidental to the storage of goods and to return these goods in good condition.

C. **Consolidation –** Producers having small quantities of lots who need to ship a larger consignment to a destination to meet the ordered quantity use the warehousing services for consolidation to gather the required quantity of goods.

D. **Traceability –** In order to track the movement of goods stored in a warehouse technology like Bar-coding or RFID (Radio Frequency Identification Devices) tagging etc. While a Bar code may contain key information about the goods deposited, the RFID tagging is a system that is capable of holding a large amount of information about the product and its further movements.

E. **Pledge Financing-** When goods are deposited in any warehouse the depositor gets a warehouse receipt, which acts as a token of the deposit of goods. The warehouses registered with WDRA can also issue a Negotiable Warehouse Receipt (NWR) in favour of the owner of the goods.

> Warehousing allows for timely delivery and optimized distribution, leading to increased labor productivity and greater customer satisfaction

F. **Easy handling-** Modern warehouses are generally fitted with mechanical appliances to handle the goods.

G. **Transportation-** The warehouse does provide transport arrangements to the bulk depositors if so required, by collecting the goods from the place of production and sending goods to the place of delivery.

H. **Reverse Logistics –** It is the process of moving goods from their typical final destination back to the warehouse, to capture value, for recycling, proper disposal or for remanufacturing. It is a part of handling customer complaints by either returning the cost to them or making further improvements in the products.

I. **Clearing and Forwarding -** Clearing and forwarding involves two service providers, namely the clearing agent and the freight forwarder, which provide a service, on behalf of an importer or exporter, with the physical movement (logistics) and legalities (customs) concerning customs clearance in importing or exporting goods from one country to another. The transfer of goods can be easily done to the buyer by transferring the warehouse receipt.

J. **Economic services–**Small businessmen by paying nominal warehousing charges can preserve their raw materials as well as finished products in public warehouses, which saves them from the burden of constructing their own warehouses at a heavy cost.

## INTEXT QUESTIONS 17.1

1. What is the full form of FMCG?
2. Select which of the following is incorrect-
   i. The warehousing industry is getting better organized due to increasing institutional investor participation.
   ii. We do not require warehousing as goods can be shifted directly to the user.
   iii. Warehouses provide value addition to goods.
   iv. Warehouses are an important component of the logistics industry.
3. What is an RFID system?
4. What is the basic function of warehouses

## 17.3 MATERIAL HANDLING AND STORAGE SYSTEMS

Manual handling of goods is having various issues like inefficiency, inordinate delay in operations besides scope for higher handling losses. The modern warehouses have got better technology options particularly in the packaging and handling system , which can be integrated with warehouse operations for better efficiency as briefed below-

**A. Packaging** - Automated packing, strapping and wrapping solutions make the stored packages of uniform size to achieve best space utilisation and also fit well with the lifting devices for easy handling. Palletisation of the packages is another good option in the efficient handling of the goods.

**B. Material handling options**– Equipment like, trolleys, forklifts, hand pallet trucks, mobile bag stackers etc. are helpful in securely lifting even heavy packages and stacking them at the desired position. Computer monitored automated stackers are also available for the modern warehouses. Similarly dock levellers are used for proper placement of loaded trucks / empty trucks for receipt/ delivery of stocks, along with the warehouse plinth, at the door point to avoid spillages falling on the ground.

> Warehouses provide the equipment and supplies you need to Store, Move, and Package and Process orders from customers

**C. Transportation-** Variety of transport systems like bulk handling carriers, reefer vans/ trucks, temperature-controlled vans/trucks, container carriers, trailers are available today which are fully integrated with a multimodal transport system to ensure the safety of goods moving from the warehouses. Computer-aided vehicle tracking and monitoring systems ensure timely delivery of goods from the warehouse to various

destinations. Automatic Guided Vehicle System (AGVS) and Radio Frequency Data Terminals (RFDT) are some of the technological tools, which help in vehicle tracking and monitoring.

## INTEXT QUESTIONS 17.2

1. What is the full form of RFDT?

2. What is the full form of AGVS?

## 17.4 USE OF TECHNOLOGY IN WAREHOUSE MANAGEMENT

The success of any industry largely depends on the efficiency with which it identifies and adopts new emerging technologies. The technology options help in simplifying the processes by putting in place a flexible operating system with simplified and smooth handling and operating processes. With reduced manual intervention, chances of operational failures are minimised with an overall increase in the efficiency levels. Judicious use of technology also helps in the reduction of operational expenses.

### 17.4.1 Mechanization and Automation of Handling and Storage System

Mechanization and automation of agricultural produce storage systems is necessary to bring in efficiency in handling and storage of agricultural produce during different pre-warehousing/post warehousing stages as well as during storage. Substantial degree of mechanization and automation has been integrated with a warehouse over the past years. The process starts from the farm level to the warehouse system/infrastructure involving innovative material handling and storage, retrieval, and systems.

**A. Technologies at the farm level –** Farm-level management of agricultural produce is the beginning of preparing the produce for long term warehousing. This begins with cleaning/grading machinery along with facilities for testing of the quality, weighing facilities, bagging systems and loading/ unloading arrangements. Horticultural produce and other perishable products also require pre-cooling systems and pack-houses for conditioning the produce to pass through refrigerated transport and cold storage. Farm-level small capacity transport systems also play a major role in the safe and secure movement to the warehouses.

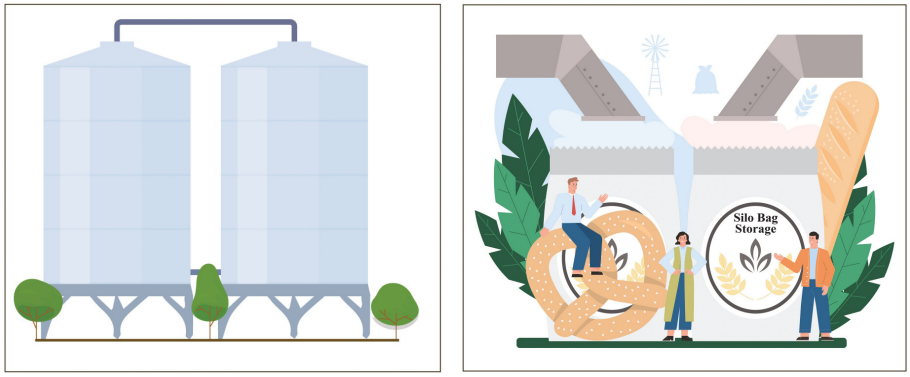
**B. Warehousing systems –**Different types of agri-produce warehouse systems are briefed as under:

**a. Conventional warehouses –** These are the most common type of warehouses

in the form of godowns used for storing dry produce under ambient conditions in bags. There are many innovations introduced in these warehouses viz. use of translucent roof sheets for better illumination, use of self-supporting truss-less roofing, use of pre-painted, poly-coated galvalume sheets in place of asbestos sheets, automated doors, turbo ventilators on the rooftop, solar rooftop panels etc.

**b. Pre-Engineered Buildings (PEBs)** – These kinds of warehouses are structures engineered in a factory and assembled at the site of the unit. These are generally steel structures assembled with bolted connections.

**c. Silo** – These are bulk storage structures in the form of vertical or horizontal storage structures made of steel or concrete in different shapes. (***Fig. 17.1 (a)***)




***(a):*** Steel Silo ***(b):*** Silo bag

***Fig. 17.1:*** Mechanization and automation of handling and storage system

**d. Silo Bag Storage** - This is hermetic storage in the form of the tubular underground airtight bag from which most oxygen is expelled by the bagging machine during the grain filling process, increasing pressure and compaction (***Fig. 17.1 (b)***) Once the bag is sealed, no oxygen will come inside, and temperature will not rise. The breathing process of grains, microorganisms, and insects consume the remaining Oxygen ($O_2$) and generate Carbon Dioxide ($CO_2$). This creates a Modified Atmosphere which stops the metabolic process of grains and inhibits the growth and development of moulds & insects, creating a naturally safe environment for storage.

**e. Vacuum processed storage (VPS)** – Grains are filled in airtight big sized sacks from which air is sucked out and sealed. A vacuum is created inside which would ensure a longer shelf life of grains and help easy handling and storage of these vacuum packs at any place.

### 17.4.2 Warehouse Infrastructure

Apart from the technological innovations in warehouse structure, there are many systems

wherein new technology has the potential to bring in higher efficiency. These may be briefly discussed as under:

**A. Safety and security** – Conventionally a boundary wall, proper entry gate, godowns with stronger doors with good locking system and a team of security guards constitute the warehouse security system. However, CCTV surveillance is gaining popularity as it provides a view of multi-locations in the premises even on the mobile phone with a system of alert for any unauthorised entry. There are also gazettes in the form of smart cards, fingerprint readers, iris scanners etc. which allow entry to only authorised persons in the warehouse premises. Technologies are also available to track the visitors' movements in premises based on the chip-enabled visitor badges. Smart night lighting arrangement in the premises also helps in night surveillance.

**B. Infrastructure for weighment:** – Generally the bigger warehouses have a weighbridge which may be mechanical or electronic, whereas smaller warehouses possess platform scales (mechanical or digital) of reasonable capacity. Now technology options are available to integrate the weighbridges or platform scales with the computerised operational management application of the warehouse.

**C. Fire Safety** – Technology applications for fire safety involve fire hydrant/sprinkler system, smoke detection technology and fire alarm system.

**D. Quality testing technology** – Automation of quality testing technology includes the use of auto samplers, a variety of electronic moisture metres, automated systems for testing physical quality (using image scanning technology) and chemical parameters of the quality of agricultural produce in the warehouses.

**E. Preservation technologies** – there are innovative tools for automated pesticide application and safety systems, phosphine generators and application systems for large scale grain fumigation and fumigant auto monitors which greatly improve the efficiency and effectiveness of various treatments to preserve the stock during warehousing.

## INTEXT QUESTIONS 17.3

1. Mechanisation and automation of handling and storage system of agricultural produce is necessary to (choose correct options)

   a. increase efficiency  b. reduce wastages

   c. operational failures  d. high expenses

## 17.5 STACKING AND SPACE UTILISATION

### A. Types of stacking

There are different types of stacking patterns followed to keep the packaging on the warehouse floor or in rakes. Stacking on the floor is carried out in the following three ways:

a. **Simple stacking** – In this stacking the packages are vertically piled one above the other up to a limited height of approximately 10 units. This type of stacking is not very stable and is used only during transshipment operations. A simple stack of a fixed height helps in easy reconciliation of the quantity unloaded and transshipped.

b. **Criss Cross stacking** – Used for stacking bigger lots with a longer storage duration. In this type of stacking orientation bags in different layers is alternated to create a strong holding of the packages as illustrated in the (**Fig.3**)

c. **Block stacking** – In this type of stacking stack, the base is divided into many blocks as per the size of packaging and dimension of the stack-based. In each block, a different pattern and orientation of packages are adopted which keeps alternated in each layer within the block. This creates smaller sub stacks within the stack which are quite stable. This system is followed in the warehouses when the size of the lots is smaller.

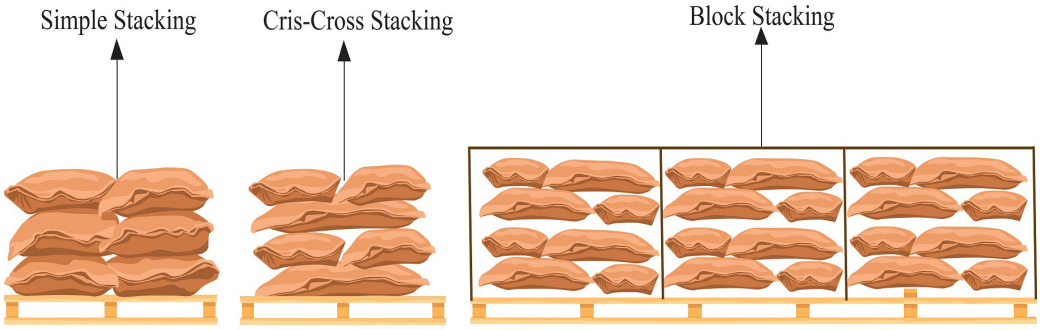



*Fig. 17.2:* **Different types of stacking followed in a warehouse**

### B. Stack planning

a. **Size of stacks –** Size of stack is decided based on the package size, godown dimensions and requirement of space for various operations like handling the stock, carrying out monitoring/inspection and undertaking various treatments/fumigation etc.

b. **Drawing up a stack plan –** A stacking plan is the drawing of the godown floor on a piece of paper and dividing it into rectangular or square blocks having dimensions into multiples of the packing size. For example, the packing size of $3^{1}x2^{1}$ may fit in a

stack size of 30'x20' or 15'x10' or even 12'x8'. It is also required to leave a space of 2.5 feet between stacks called alleyways and an operation passage of 4 feet touching all the stacks and connecting the door points. Care is also to be taken to ensure that pillars and other obstructions don't come in the middle of the stack to obstruct putting up fumigation covers on the stack. The ultimate idea is to cover maximum stock with these requirements in the godown. On the floor also stack lines are to be neatly drawn (5 cm wide) with a prominent colour and the serial number of each stack inscribed on each stack base.

c. **Stack height –** The stack height is based on the shape and dimensions of the packing, weight of the packed goods, load-bearing capacity of the commodity and the floor. Maximum stack heights of some of the important commodities are given in ***Table 17.1*** as under:

***Table 17.1:*** **Maximum stack heights of some of the important commodities**

| No. | Commodity | Maximum Stack Height | |
|---|---|---|---|
| | | In Metres | In Feet |
| **CEREALS** | | | |
| 1. | Wheat, Barley, Paddy, Jowar, Wheat Bran | 4.6 | 15 |
| 2. | Whole Pulses, Maize, Rice | 3 | 10 |
| 3. | Rice Bran (In dry condition) | 3.0 – 3.7 | 10-12 |
| **MILLED PRODUCTS** | | | |
| 4. | Milled Pulses, Sooji, Maida, Besan, Wheat Atta | 4.2 | 14 |
| **OILS & OILSEEDS** | | | |
| 5. | Oils tins (4-gallon tin) | 3.4 | 8 |
| 6. | Oil drums | 2.1 | 7 |
| 7. | Cumin seed | 4.6 | 15 |
| 8. | Oilseeds & oil cakes, Arecanut, Cashew pods, Coffee pods | 3.7-4.3 | 12-14 |
| 9. | Groundnut kernels, cashew nut Kernels | 3-3.7 | 10-12 |



## 17.6 PROCEDURE IN RECEIPT AND DELIVERY OF STOCKS

### A. Steps involved in depositing goods in warehouse

A comprehensive list of activities has been proposed by WDRA for receiving goods for the purpose of storage in a warehouse. Flow chart (***Fig. 17.3***) depicts the procedure. Step wise procedure is as under:

- Submission of Deposit Application
- Entry of loaded vehicles in the premises after making entries in gate Register
- Weighment of the stocks
- Assayingthe quality of the stocks
- Unloading of stocks from the transport vehicle into the godown.
- Stacking of stocks in the godown
- Preparation of necessary records
- Issuance of a negotiable warehouse receipt or non- negotiable warehouse receipt as the case may be.
- Completion of the entries in the Office Record

### B. Steps involved in the delivery of goods

The stocks shall be delivered to the depositors or his authorised representative on his request as per the following procedure:

- Depositor/eNWR holder requests for delivery of stock to the warehouse in charge who authorises delivery of the stock after due verification.
- Verification of documents/ records, particularly the warehouse receipt is done in the office. Warehouse rental and other charges assessed and depositors informed about the same.
- Inspection of the quality of the stocks.
- Collection of storage, insurance and other charges.
- Issuance of the delivery order to the Godown in charge.
- The entry of the empty vehicles in the warehouse premises.
- Weighment of the empty vehicles, if required.
- Placement of empty vehicles at the gate of the godowns for loading.
- Weighment of the loaded vehicles.

- The endorsement in the warehouse receipt in the event of partial delivery or its surrender to the warehouse in charge in the event of full delivery of covered goods.
- Preparation of the gate pass.
- The exit of the loaded vehicles, after weighing, if required.
- Preparation of the records and making entries in the Godown/office registers.


***Fig. 17.3:*** **Flow chart of receipt/ delivery operations**

### C. Weighing during delivery

The same mode of weighment shall be resorted both during the deposit and delivery of goods in a warehouse to avoid instrumental error.

### D. Quality assessment during delivery

i. Before delivery of deposited goods to the depositor or its authorised representative the representative sample of stocks shall be drawn and tested for its quality, moisture, infestation if any, and grade.

ii. The observations shall be recorded in relevant records and be authenticated by the depositor, its authorised representative, or the electronic negotiable warehouse receipt holder.

### E. Transfer of stocks

Transfer of stocks from one depositor to the other by endorsement can also be done in case of a negotiable warehouse receipt but it shall require the consent from both the parties. Re-assaying of the quality of the stocks can be carried out if so desired by the endorsee.

## INTEXT QUESTIONS 17.4

1. List 3 factors which influence stack height.
2. Which document will have to be shown to the security staff at the time of delivery?
3. The warehouse receipt must be surrendered at the time of partial delivery (true/ false)

## 17.7 CHANGING CUSTOMER PERCEPTION AND COMPETITION

Customer perception is the opinion formed about a product, brand or services offered by the customers. Customers are typically the brand ambassadors of the product or services offered to them, that is why they are key to the success of the business. In today's competitive world, it is always important to provide best services second to none for survival of any business. Customers always expect to be given VIP treatment at all times, which can in turn help the business operator to maintain its brand image and higher turnover. It must be remembered that the type of customer service experience by the customers will lead to adoption of the brand as a part of their lifestyle, and facilitate the regular usage of the services and products. A satisfied and happy customer always

adds value to the brand, and helps in retaining the business in the competitive situation ahead of all competitors.

**How to improve customers' perception**

- Identify the needs and requirements of your customers.
- Always develop effective communication to understand customer's perceptions.
- Obtain constant feedback and devise methods to improve services.
- Never compromise with quality of services for petty gains.
- Share customer endorsement with other prospective customers.

## 17.8 NEED FOR BAG TO BULK STORAGE OF GRAINS

"A grain saved is grain produced" is in the best interest of mankind as it is only a measure for providing food security. It is however very painful to know about the huge quantum of post-harvest losses of agricultural produce due to poor storage practices at different levels. The reason for such huge post-harvest losses mainly attributed to lack of scientific storage facilities, inefficient transportation system, and poor warehousing infrastructure, such as inadequate warehousing facilities and farmers' inaccessibility to value-added services.

The Government of India has finalised the National Policy on handling, storage and transportation of food grains in June 2000, to involve efforts and resources of public as well as private sectors, both domestic and foreign, to build and operate infrastructure for bulk handling. This system is a modern technology of automated / mechanised storage and handling of grains, which has the potential to substantially decrease post-harvest wastages. Most of the countries except a few Asian countries are already using bulk storage and handling to save grain losses. Even China has switched from bag to bulk long back.

Bulk storage or modern storage has advantages over bag storage, as follows:

- Low running costs;
- Low labour requirements;
- Efficient handling;
- Reduction in loss due to spillages and rodents
- Lesser consumption of pesticides
- Efficient and effective fumigation operation;
- Less land area requirement;
- Complete control of aeration;

- Safe storage of the grain for longer periods;
- Mechanisation of all operations;
- Lesser risk to manpower.

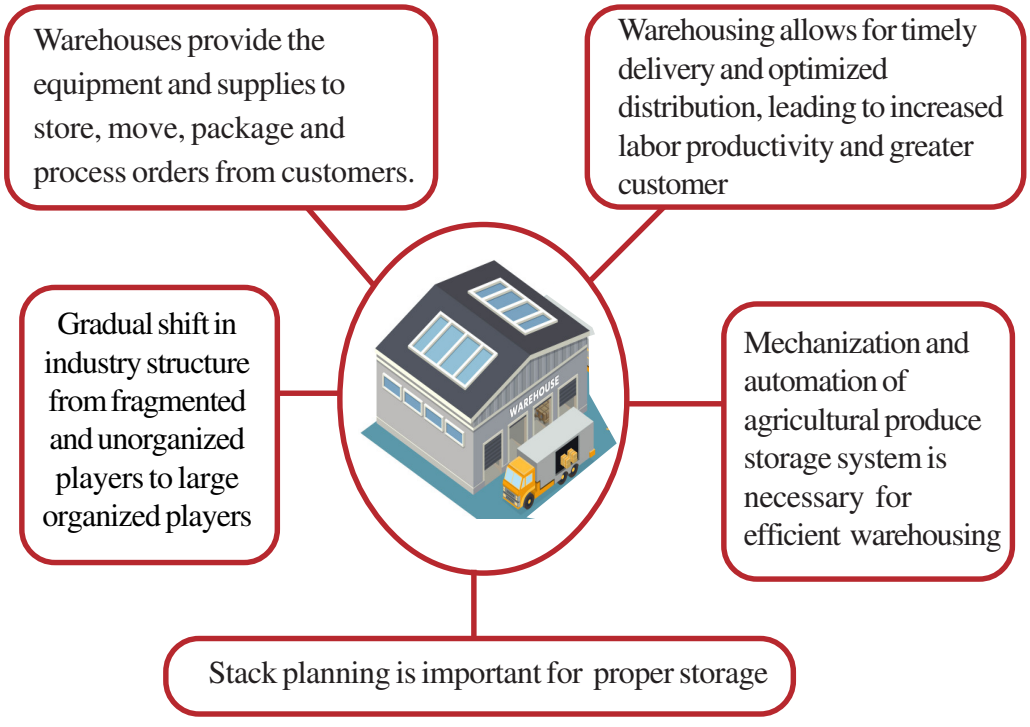
Various studies have demonstrated that in the long run, bulk storage is very economical and an effective method to reduce post-harvest wastages.

## INTEXT QUESTIONS 17.5

**STATE TRUE/ FALSE**

1. A satisfied and happy customer always adds value to the brand, and helps in retaining the business in the competitive situation ahead of all competitors.
2. Always develop effective communication to understand customer's perceptions.
3. In bulk storage we need more space for making a unit.
4. Bag storage is good for India as we have lot of labour to handle it

## WHAT YOU HAVE LEARNT



## KEY TERMS

| | |
|---|---|
| Agriculture sector | Customer satisfaction |
| Fast-Moving Consumer Goods | Foreign direct investment |
| Grading | Mechanisation |
| Pledge Financing | Reverse Logistics |
| Risk management | Silobag, |
| Stacking | Stack pla |

## TERMINAL EXERCISE

1. What is the benefit of quality description in the negotiable warehouse receipt?
2. Who authorises delivery of the stock to the depositor?
3. Why should the same mode of weighment be resorted both during the deposit and delivery of goods?
4. Which type of stacking is done in case of small lots?
5. How can warehouses facilitate the sale of goods?
6. How has the warehousing industry evolved in India over years?
7. What are the different arrangements made by the Government to promote warehousing infrastructure in India under public and private sectors over years?
8. Write a short note on Key emerging trends in warehousing.
9. The warehouse acts as a bailee of goods. Please comment.
10. Write a short note on safety of warehouses.
11. Please elaborate how warehousing acts as a key component of the commodity supply chain? What are new trends in warehousing to make it look more attractive to customers?
12. Discuss the procedure of receipt and delivery of goods in the warehouse? Why it is

important to have quality assessment and weighment at the time of receipt and delivery of stocks.

13. What is stack planning and why is it important in warehouse operations? Discuss different types of stacking patterns, What is the need for automation and mechanisation in the warehouse?

14. What methods are used in this direction? How technology helps in increasing efficiency in warehouse operations.

15. Warehousing provides a variety of services. Discuss in detail.

## ANSWERS TO INTEXT QUESTIONS

### 17.1

1. Fast-Moving Consumer Goods.

2. i

3. RFID tagging is a system which is capable of holding a large amount of information about the product and its further movements

4. The basic function of warehouses is to preserve goods on a large-scale in a systematic and orderly manner

### 17.2

1. Radio Frequency Data Terminals

2. Automatic Guided Vehicle System

### 17.3

1. a . b

### 17.4

1. The shape and dimensions of the packing, weight of the packed goods, and load-bearing capacity of the floor.

2. Gate pass

3. False

17.5

1. True
2. True
3. False
4. False

## DO AND LEARN

Setting up a new warehouse is to be done. What type of requirements you feel are necessary in terms of infrastructure and build a mechanised modern warehouse for agri commodities.

18

# INVENTORY MANAGEMENT OF A WAREHOUSE

Inventory management is the crucial part of managing entire inventories of raw materials as well as finished products, right from procurement, warehousing, consumption and sales. Documented procedures regarding various functions in an organization are essential in order to achieve consistency in the delivery of products and services over time are also referred to as Standard Operating Procedures. Various risks in the warehouse may be categorized as insurable and non – insurable risks. Inspection is basically a system to check compliance to lay down systems and audit is verification of the compliance obligations including inspections. The success of agri. Warehousing business depends on its ability to ensure the safety of stocks stored and offer compensation in case of any loss to the stock.

## LEARNING OUTCOMES

After studying this lesson the learner:

- explains the importance of inventory management;
- identifies the causes of risk and their management in inventory management;
- summarizes the role of inspections and audit in risk mitigation.

## 18.1 WHAT IS INVENTORY?

Inventory refers to the goods, commodities or any material held for any business activity like sale, production or usage. It is considered as one of the most important aspects of any business model.

### 18.1.1 What Is Inventory Management?

Inventory management is the crucial part of managing entire inventories of raw materials as well as finished products, right from procurement, warehousing, consumption and sales. Inventory management systems help to make better decisions about stock levels and improve overall business efficiency. This allows keeping track of stock levels across all warehouse locations and across all inventory cycle stages.

Inventory is one of its most valuable assets requiring proper management as any shortage at the time of requirement can go against the business interests of any entity. On the contrary if large inventories are kept without taking into account the actual needs it may become a liability as excess stocking bears the risk of spoilage, theft, damage besides affecting financial health and prosperity of the organization.

### 18.1.2 Benefits of Inventory Management

Proper inventory management is the key to running a successful supply chain. Regular tracking of the stocks helps in various benefits as under-

A. **Accuracy:** Proper and accurate stock management helps in timely and correct decisions about understanding supply and demand of various items.

B. **Reduced Risk:** Inventory management facilitates proper sale of goods due to timely tracking.

C. **Efficient planning:** Better planning and management helps a business entity to minimise the stock carrying cost as well as its replenishment as and when required.

D. **Foresightedness:** With inventory tracking and stock control, sales trends or tracking of recalled products or expiry dates can be easily maintained. An efficient and organised warehouse based on demand, reduces labour costs and speeds order fulfilment.

E. **Better Terms with customers:** Inventory management provides leverage to negotiate better prices and terms with suppliers based on type of products in storage. It also adds to customer loyalty.

F. **Better Productivity:** Good inventory management solutions save time that could be spent on other activities.

G. **Higher Profits:** A better understanding of both availability and demand leads to higher inventory turnover, which leads to greater profits.

> Inventory management is the entire process of managing inventories from raw materials to finished products.



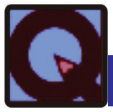
### 18.1.3 Procedure for Internal Verification of stocks In the Warehouse

Periodic verification of the stored produce concerning its recorded quantity in the warehouse and quality is an important procedure for inventory management in the warehouse. Normally stock verification at fortnightly intervals is recommended but the warehouse operator can prescribe even a shorter interval.

**A. Physical verification** – Physical count of the units of various commodities as per the warehouse receipts issued by the warehouse in-charge is conducted at the prescribed interval to check the accuracy of stock position by reconciling the physically verified stock with the book balance or electronic balance, as the case may be. Any shortage or excess needs to be investigated to find the facts and keep the books of accounts in order.

> Warehousing is a requirement for most businesses that manufacture, import, export or transport goods.
>
> Warehousing is not an unnecessary expense, but it saves you money and boost your productivitythrough better inventory control.

**B. Qualitative verification** – During the verification of the quality of the stored goods samples are drawn from each stack to check the presence of insect infestation in terms of the type of insect and intensity of insect population/infestation. The health of the stock is also checked by analysing key parameters like damaged, discoloured, weevilled (insect-damaged) or chalky grains in the sample. Hygienic conditions in the warehouse premises including accumulation of loose spillages in the godowns, damages to the infrastructure, presence of rats, birds, monkeys etc. are also required to be monitored and properly documented for curative action if any.



## INTEXT QUESTIONS 18.1

1. What is qualitative verification?
2. Fill in the blanks
   a. _____helps a business entity to minimise the stock carrying cost as well as its replenishment as and when required.
   b. To check the accuracy of stock with reference to book balance _____of the units is necessary.
   c. _____helps in quality determination of the stocks.
   d. Inventory management systems help to make better business decisions about_____.

## 18.2 NEED FOR A STANDARD OPERATING PROCEDURE TO RUN A WAREHOUSE

### 18.2.1 What is a Standard Operating Procedure (SOP)

We must understand that there are a number of guidelines and procedures to be followed for the smooth and standardised functioning of the warehouse. Documented procedure regarding various functions in an organisation is essential in order to achieve consistency in the delivery of products and services over time. These documented processes are also referred to as Standard Operating Procedures (SOPs) and are accepted as a tool for improvement and standardization of organizational processes.

SOP is a written document detailing step-by-step instructions to guide the performer of a process or a function or an activity relating to adoption of best practices in performing a specific function in a most optimal way. This document lists all the activities and specifies details like what, why, how, when, where and by whom (commonly called 6 Qs) for execution of the different jobs.

SOPs provide guidance for operation of a warehouse, to promote smooth, efficient, effective and credible warehousing business. The well-defined procedure helps in not only standardised functioning of the warehouse but helps in timely completion of tasks to ensure customer satisfaction. SOPs provide employees with relevant information about all the safety, health, environmental, to perform a job properly and safely. SOPs help the employer to quickly detect deviations, take up remedial measures and fix up responsibility for the same.

SOP helps in

- Saving time
- Safety
- Efficiency and consistency
- Lesser scope of errors.

### 18.2.2 Benefits of Standard Operating Procedure

The development and use of SOPs are an integral part of a successful quality system as it provides individuals with the information to perform a job properly, and facilitates consistency in maintaining the quality of the end product. SOPs help the organizations to make the best practices as a part of organizational culture in performing the various processes.

- Well defined steps to perform a work.
- Standardization of activities irrespective of the person performing it.



- Improved safety and security in operation.
- Consistently in the end product.
- Easy to train a new employee.
- Sets a standard on expected performance
- Minimizing wastages in processes
- A platform for continuous improvement
- A document to highlight management's standing Court of Law.

## 18.3 STANDARD OPERATING PROCEDURES FOR RISK MITIGATION

SOP describes in detail all the key steps to implement a reliable and effective risk mitigation for certain agents and processes, which present extreme hazards. It is necessary to have proper hazard assessment to develop an SOP.

### 18.3.1 Process of SOP

**A. Assessment of risk:** The activities involved during this phase are identification of the primary, secondary and management processes, identification of the stakeholders and understanding the need for SOP. This is the initial stage of planning in SOP creation.

**B. Development:** During this phase the process maps for the various identified processes and stakeholders are developed, to understand the requirement of SOPs.

**C. Implementation:** This is also a change management stage where the practices are reviewed and all the employees are trained and corrected to attain a state of best-practices in the future.

**D. Continuous Improvement:** The development of SOP is not a one time process but it has to keep abreast of the various developments like market dynamics or disruptions etc. that undergoes in the industry. The concerned department responsible for the SOP needs to assess this need for changes and update the SOP to prolong effective functioning of the company.

## INTEXT QUESTIONS 18.2

1. Documented procedure regarding various functions in an organization is referred to as_____.

2. Which of the following is not a part of SOP?

   a. steps to perform a work.

   b. Standardization of activities

   c. Sharing of risks

   d. Easy to train a new employee.

3. The development of SOP is a one time process. (State True/ False)

## 18.4 CAUSES OF MAJOR RISKS

### 18.4.1 What are the Various Risks?

Various risks in the warehouse may be categorized as **insurable** and **non – insurable risks.** Insurable risks include various perils viz. fire, flood, cyclone, earthquake, riots, strikes, acts of terrorism, theft burglary and various types of frauds. Non-insurable risks, on the other hand, include poor-quality preservation of goods, inaccurate recording of details of goods or the owner of deposited goods. While the warehouseman has no control over the insurable risks, the non- insurable risks largely arise out of the quality of supervision of warehouse operators.

### 18.4.2 Procedure for Risk Management in The Warehouse

Mitigating non-insurable risks would require the warehouse operator to have a well-defined process of inspection, preservation of goods and monitoring of losses/damages. On the other hand, for managing insurable risks the warehouse operator shall be required to adequately insure the deposited goods against fire, flood, earthquake, theft, burglary, frauds/misappropriation, riots, strikes and terrorism (if applicable) etc.

It is also important to understand that even though the goods are insured against various perils, the warehouse operator would need to show that he has put the required system in place to prevent the occurrence of these incidents. This will help him in getting the claims settled by the insurance company easily.

### 18.4.3 Managing Theft, burglary and frauds/misappropriation cases

Thefts, burglary, frauds/misappropriation are major risks in a warehouse which not only cause heavy monetary loss to the organization but badly damage its reputation due to customer disputes, litigations, government penalties etc. Though suitable insurance policies are available to cover these risks, it is always prudent to take necessary measures to avoid such happenings.

### 18.4.4 Preventive Measures:

**A. Physical security of premises** – The warehouse premises should have a proper boundary wall or barbed wire fencing which does not allow entry inside. There should be well-marked and strong entry and exit gates having provision for locking during off times. The godown doors and shutters should have a locking system to prevent any housebreaking. The premises will need to be provided with nighttime lighting arrangements.

**B. Security guards** – A warehouse needs to have a sufficient number of well-trained security guards to provide round the clock watch and ward. The roles and responsibility of these guards may be well defined towards checking for any unauthorised entry in the premises or any attempt for theft/burglary. They will be deployed as per a duty roster to ensure the presence of adequate security guards as per need. These guards are also enabled to communicate any risk situation described above without delay.

**C. Security gadgets** – In order to strengthen the security, the warehouse is also required to deploy the latest security gadgets like closed-circuit TV cameras, drones, RFID tags etc. It is also necessary to track the movement of internal employees or external visitor's on-premises by using GPS/geo-tagging those people. Remote monitoring through mobile/desktop/laptop-based access to the CCTV feeds also greatly helps in maintaining security in warehouses.

**D. Systems and procedures** – Existence and scrupulous implementation of standard operating procedures in a warehouse greatly help in preventing possibilities of misappropriation/frauds. A good SOP should have processes to address all the possible areas of fraud/misappropriation.

**E. Regular monitoring and inspection/audit** – The warehouse should have an SOP for obtaining various types of structured and ad hoc reports and returns to get a true picture of the transactions in the warehouses. An abnormal report should be a cause of organising a surprise visit/audit to investigate the same and take immediate steps to rectify loopholes in the system. The warehouse in charge should also undertake periodic physical verification of quantity to match it with the records of the warehouse. The test check of quality should also be made at regular intervals.

## 18.5 ACTION TO BE TAKEN IN THE EVENT OF THEFT/ BURGLARY/ FRAUD IN A WAREHOUSE

Despite taking all the precautions incidents like theft/burglary/fraud may happen. It will be necessary for the warehouse in-charge to take the following steps immediately to get

the matter resolved and also to facilitate an easy settlement of insurance claims:

A. The place of the incident may be visited immediately and initial information collected to support the police during the investigation.

B. Not to disturb anything at the site of the incident.

C. The case may be reported to the police and other authorities (including the depositor and the insurance company) for action in the matter. Apart from reporting the matter to police on phone a written complaint and FIR may be lodged. A copy of the FIR in the format prescribed by the local police department may be obtained for future reference and submission to the insurance company.

D. The matter may also be reported to the insurance company along with the following details:

   a. Insurance claim for the loss on prescribed Claim Form:

   b. Copy of initial intimation

   c. Copy of FIR

   d. Brief Incident Record

   e. Location of the Godown / Site

   f. Details of loss (This shall be based on the valuation of the Goods as per records of the warehouse with necessary evidence).

   vii. Copy of the insurance policy.

   viii. Photographs of the incident.

   ix. Newspaper cutting, if any

   x. Certification of Fire Brigade, Police, other local authorities, as applicable

   xi. Relevant extracts of the stock ledger, insurance register

E. Soon after receiving the insurance claim, the depositor may be immediately compensated towards the losses suffered by him to avoid any dispute.

F. Roles and responsibilities of the staff at different levels may also be clearly defined for action in the event of such happenings.



## INTEXT QUESTIONS 18.3

1 Choose which of the following are non-insurable risks-

Fire, Flood, Cyclone, Misappropriation, Earthquake, Poor preservation, Inaccurate recording of details of goods, Riots,

2. We need not spend money on deploying security guards as preventive measures for the insured goods. (True/False)

3. In the event of theft in the warehouse the position needs to be informed to

   a. Police

   b. Insurance

   c. Higher authorities

   d. all of these

## 18.6 INSPECTION AND AUDITS FOR RISK MITIGATION

Inspection is basically a system to check compliance to laid down systems and audit is verification of the compliance obligations including inspections. It is very important that the quality of the produce is of top quality so that they comply with international and national standards, market regulations and as per customer requirements. In any industry or sector, your products and services must conform to the standards and regulations required by your target market. Remember if we fail to do proper compliance, it will lead to breakdown of the supply chain and loss of image in the market. Identifying the correct market regulations is a complex challenge and requires proper investigation and detailed industry knowledge**.**

### 18.6.1 Purpose of Inspection

During the inspection the inspector has to satisfy Statutory and certification requirements in addition to the basic standards, for example correct use of logos and verifying level of sales values. The inspection helps in giving proper recommendations for improvements to comply with standards. The consumer also stands benefitted as they can be assured that the selected goods have been produced as per standards.

### 18.6.2 Audit

It is a method of systematic and independent examination of various activities via a

mislaid down parameters to assess their compliance to achieve objectives".

Audits help in critical examination to manage health, safety and risk management within any organization. It helps the clients for effective management and compliance of different types of risks including legal requirements. The audit follows a systematic approach based on pre decided scope of work. The audit is conducted on specified and identified elements of the quality system as per the checklist prepared by the audit team. Each member of the team is assigned a specific job and duration of time as agreed by both the auditor and auditee.

It is always better to get the audit performed by an independent, competent, experienced and impartial party, who should submit the audit results and conclusions purely on the basis of verifiable evidence.

## A. Types of Audit

There are two principal activities carried out under the audit.

a. **Quality system audit**: of the company's documented quality system. This is referred to as a desk audit as it involves mostly a review of the documented quality system against the agreed standards and procedures.

b. **Compliance audit:** It is conducted after a quality system audit has established confirmation to reference standards of the company. This audit deals with the application of the quality system and its verification as described in their system.

The auditor and the audit team after completion of the quality systems audit or the compliance audit prepare a list of nonconformities observed during the audit. The auditee is then required to prepare a corrective action report to rectify the non-conformities. This report is reviewed by the auditor, and either accepted or returned to the auditee for amendments.

Based on the corrective action report the auditor will determine the type of follow-up action to check if the corrective action has been completed as per requirement or not. The audit report is closed after all of the non-conformities have been satisfactorily dealt with by the company. It is a very effective method of testing the creditworthiness of a company's quality management system. In many cases, the audit is performed at the request of the company to have an independent third party assessment of their quality system in a non-adversarial environment. The audit provides an opportunity to strengthen the quality system for continuous improvement. The auditor has to carry out an audit as per scope of work and examine the quality system as per laid down procedures and give his assessment on different parameters.



### 18.6.3 The Need for Audit

Industry and governments have realised that effective food control systems require verification in terms of different operations. Governments set up standards for different operations and industry must meet these limits. Some variations are noticed because of resistance to change, lack of commitment, limited resources and increased training requirements. The role of audit is therefore of increasing importance to verify that a set of standards fixed by regulators are followed at national and international level.

### 18.6.4 Why Supply Chain Fraud Happens

The food supply chains are also becoming increasingly complex with increasing population and presenting challenges in reducing food wastage, delivering safe, nutritious quality food and avoiding frauds. Motive, opportunity, or rationalisations are basic reasons for committing fraud by individuals.

The frauds due to motive and rationalisation can be reduced by adequate enforcement of the policies by the management. Effective and strong internal control system can help in adequate risk monitoring and evaluation

### 18.6.5 Measures to Prevent Fraud

A. **Database-** Keep a detailed database of all products and stock levels, which helps to have proper inventory control. Regular stock verification and audits are also done at the warehouse to ensure that the physical stocks are as per records and no mismatch is noticed.

B. **Surprise audits and inventory checks-** Another commonly recommended way to identify frauds is to conduct surprise audits and inventory checks, of both vendors and workforce. It is important to vary the audit procedures or conduct unscheduled audits to keep results accurate and improve chances of identifying any fraudulent activity. List these risks and give advice to the team to reduce liability with continued tracking and prioritisation.

C. **Inclusion of anti-fraud measures in audits**— A variety of elements can be included along the production chain of a finished ingredient, from raw materials receiving to packaging and transport into a facility, to reduce the vulnerability to fraud. The audit can review the practices followed by all suppliers down the line to ensure integrity, traceability, and security of all supplies. This is a good step to determine the preventive checks adopted by the suppliers to ensure that the products supplied to the company are of required standards and not tampered or manipulated enroute to destination.Proper documentation of likely frauds can be a strong measure to demonstrate intentions of the supplier to curb the frauds.

**D. Communication-** It's important to communicate to the organisation through the mission statement, or specific instructions to ensure integrity. The Association of Certified Fraud Examiners (ACFE) has suggested the system of giving tips, followed by investigation as the most effective way to detect fraud in the supply chain.

**E. Enforcing Basics-** Rigorous adherence to Generally Accepted Accounting Principles (GAAP) — such as enforcing the three-way split between the requestor, the receiver, and accounts payable — is important.

**F. Logical Policies-** Create logical policies that limit opportunity and reinforce integrity values. For instance periodic checks at entry and exit gates.

**G. Leveraging Technology-** Cameras in key places, barcodes to help in transactions and accuracy, and monitors in the common areas that scroll the mission and values all reinforce the basic outline. But total dependence on technology could backfire to make a small incident very extensive.

**H. Decentralisation of delegation-** Do not give control of the whole process, e.g., 'purchase department' to one person. It is better that different functions like purchase, payment etc., are handled by different persons.

**I. Block chain enabled tracking system-** The block chain can provide an efficient and reliable solution to the urgent need for product traceability and supply chain transparency by recording information at every stage of the agricultural supply chain and to remove unnecessary processes.

With the block chain-based supply chain, the agribusiness can show how a product from the farm to the shelf was handled with the strictest of adherence to laid down principles. Consumers can scan a QR code to verify for themselves the nature of their products. The adoption of this tracking system, leads to very few chances for fraudulent and counterfeit goods to enter into legitimate retail stores.

### 18.6.6 Approaches to Risk Management/ Mitigation in Agribusiness System

Various issues like market development, access to market, crop diversification, irrigation facilities, type of farming, financial aspects confront the agricultural production and marketing system. The types and severity of the risks confronting farmers vary greatly with farming systems and physical, socioeconomic, and political environments conditions as such no common guidelines for risk management can be issued. In risk management it is important to understand-

- Risk event(s),
- Risk exposure and
- The cause(s) of the risk



## A. Before Risk Mitigation planning

Once the organization's specific risks are identified and the risk management process has been implemented, there are a few different strategies that can be used for different types of risks. We must remember that each risk is unique and may require a different approach for risk management. As such mitigation strategy must be determined for each risk type and the details are described in the Risk Mitigation Plan. The level of detail depends on the program life-cycle phase and the nature of the need to be addressed but it should give an estimate of required efforts and technological up gradation for the system.

These approaches are suggestive ways to handle risks, but there is no right or wrong solution or method. **Risks in an agricultural business can be handled through one of these mitigation options or combinations thereof.**

## B. Risk Avoidance

Risk avoidance doesn't mean avoiding risks when they happen, it actually means avoiding a risk from happening, or prevention in other words. A risk avoidance strategy is designed to deflect as many threats as possible by eliminating the root cause and/or consequence by avoiding disruptions to business and costly damages. Maintaining low debt-asset ratios or healthy current account balances are examples of risk avoidance.

## C. Risk Reduction

It refers to having good management, good marketing practices and technology by managing the cause and/or consequence of company processes, infrastructure etc, to reduce certain risks. It can take the form of installing early warning systems based on available data to assess more accurately the impact, likelihood, or timing of a risk. In fact it helps in making the system efficient.

## D. Risk Sharing

It is a great way to mitigate and manage the risk in which sometimes risks are shared by different departments, customers, vendors, or external organisations through a contractual agreement whereby some of the negative risks are taken by another party, against a premium depending upon the amount of the risk assumed.

**Example:** sharing the risk with a third party like an **insurance company or subcontractor.**

## E. Risk Assumption/Retention

This refers to accepting the loss, or benefit of gain, from a risk when it occurs. Sometimes companies will retain a certain level of risk if the anticipated profit is greater than the costs of the potential risk. This is viable when the cost of insurance in length of time

becomes more than the losses sustained. Example, self insure by the company having adequate reserves.

## 18.7 EFFECTIVE MANAGEMENT OF INSURANCE FOR RISK MITIGATION

### 18.7.1 Nature and Functions of Insurance

Insurance is a method of sharing risk with a large number of people out of the few exposed to risk for any reason. Insurance provides financial help in case of untoward happenings based on predetermined valuation for which premium was paid and as per predefined terms and conditions of insurance policy and regulations under laws. Major insurance functions are as under :

A. **Protection:** The insurance provides protection against the probable chances of loss. No insurance can eliminate the likely risk from taking place, but it provides protection against future risks, accidents and uncertainty. It provides a guarantee of financial compensation against the losses.

B. **Certainty:** Insurance removes uncertainties of risk or loss to the insured as it provides certainty of bearing future risks in the form of payment of claims against its policy.

C. **Risk-Sharing:** Insurance is a method in which the loss of a few affected persons/ entities is shared by all the insured persons, by paying an annual premium towards a fund, out of which the risk exposed persons are paid as per the terms and conditions of the insurance policy.

D. **Prevention of loss:** Prevention of losses is to adopt preventive measures against unexpected losses which help in minimising risks. The adoption of prevention techniques helps Insurance Companies to rate the risk at a lower level and prescribe a lower rate of premium.

E. **Economic Progress:** The insurance protects the society from tremendous losses to property, valuable assets, destruction to machinery etc., thereby providing a platform to work hard for the betterment of the masses. The loss of the capital of the entity is minimised to a greater extent with the help of investment in insurance. The accumulated funds are invested in the productive channel, thus benefiting the industry, the business, and the individual.

F. **Peace of mind & Efficiency:** Insurance eliminates worries and miseries of losses, which increases better mental health of the workers. The carefree person can devote his body and soul together for better achievement and efficiency.



**G. Risk Free Trade:** Insurance promotes export insurance, which makes the foreign trade risk free with the help of different types of policies under marine insurance cove

Insurance is a valuable tool of **risk mitigation** which involves the contractual shifting of a pure risk from one party to another. Risk transfer reduces risk to an organisation by passing the risk along to others. This is an effective instrument as most of the organisations do not have the capacity to meet the cost of risks at their level. Purchasing insurance however is not enough to avoid risk management as the Insurance doesn't cover all the risks as every insurance policy has exclusions, which have bearing on the risk management process. Many risks including brand integrity, goodwill of customers etc., are not insurable.

The purchase of an insurance policy after payment of premium, allows passing-on a specified risk from the policyholder to the insurance company. It is always considered safe to pay an agreed premium to the insurance company rather than bearing the risk of incurring heavy loss due to occurrence of any mishaps. The insurer who manages the risk adequately will have better peace of mind, which will go a long way in building the inner core strength of the organisation and effective handling of all functions.

An effective risk management practice also requires commitment to loss reduction or prevention to satisfy the insurer, which does not guarantee elimination of all risks. The organisations who can manage their businesses well and demonstrate effective risk management processes and procedures are likely to get better options from the insurance companies.

Some of the entities do not go for insurance cover but prefer to bear such losses by creating specific reserves to meet any such contingency. It is generally done by transfer amount equivalent to insurance premium payable every year to this reserve. This approach must be thoroughly calculated as in case of any mishap the accumulated funds may not be sufficient to cover the quantum of losses suffered by the organisation. The degree of risk would be higher in initial years with small reserves.

### 18.7.2 Role and Responsibility of insured in Agri Warehousing

In agri-warehousing, the responsibility of the warehouse man acts as bailee of the goods being stored in the warehouse and is responsible for the safe custody and preservation of goods to maintain its quality and quantity during the period of storage. The customers small or big deposit their goods in the warehouse for a specified period and take its delivery after payment of agreed tariff as warehousing charges. In the event of any mishap and damages to the stored goods the warehouse manager is liable to reimburse its cost to the depositor of the goods.

The occurrence of an event of risk can be managed at two levels, one is before the occurrence of the event and another is after its occurrence. The warehouseman has to take various steps/precautions to ensure the preservation of stocks in safe condition. The likely situations that may become the cause of damage to stocks could be fire, flood, theft/burglary, etc. In case the goods are stored in a cold storage, the continuous running of the refrigeration plant is necessary to maintain the required temperature and humidity inside the cold storage chambers.

The warehouseman has to follow prescribed guidelines to store the goods scientifically, ensuring stable and easily countable stacking as per approved stack plan so as to permit sufficient alleyways for operations and pest control activities besides proper aeration of the stocks. The main objective is to avert the risk of getting agri-stock damaged due to any reason; Most of the organisations have developed their own code of storage practices (CSP) to ensure safety of stocks as per the type of goods and requirements of the customer.

As a risk management strategy, all possible steps should be taken to avoid occurrence of an event of risk. However, if by chance the stock gets damaged, say by fire, the first step is to extinguish the fire. Fire hydrants, sprinklers, fire extinguishers etc., are to be used to control fire. It is necessary to always keep all equipment in a ready-to-use mode to facilitate their use at a very short notice. Once fire is under control, the next step is to segregate the damaged stocks from the sound stocks so as to avoid further damage to the sound stocks. Same steps are required to be taken in case of damage of stocks by other factors like flood. However, to minimise the risk of damage of stocks due to flood or overflowing of drains, the plinth level of the godown should be made at sufficient height. Drainage system within the godown and its surroundings should be kept in perfect condition to avoid blockage/stagnation of water. Roof leakages, if any, are to be plugged immediately.

The movement of unauthorised persons in the storage premises is to be severely restricted for protecting the stocks from theft or burglary. Surveillance systems in the godown and nearby area would be helpful to reduce this risk. Periodical inspection and audit will help in keeping a check and early detection of any undesired incidence. The audit will also encourage the warehouse staff to be more careful. In case of an incident of theft in a godown, the matter should be immediately reported to the Police and the culprit is brought to books and punished. This will also be an example for others to think twice before committing such a crime.

### 18.7.3 Minimising the Insurance Premium

The insurance premium is directly linked with the probability of occurrence of an event



of risk proposed to be covered under the insurance policy that is why the insurance companies charge differently for different situations.

For example if the warehouse is constructed with A Grade construction material, premium charges may be less as the chances of occurrence of an event will be reduced. On the other hand, if the construction material used is substandard or the godown is not constructed as per scientific basis, insurance companies may charge higher premiums or even refuse to provide insurance cover. Same also applies for obtaining insurance cover to protect it from the risk of flood. Generally, the insurance company official visits the site and inspects the godown to be satisfied about quality of construction and other checks maintained at the warehouse and accordingly assess the possibility of occurrence of risks.

The amount of premium charged by insurance companies is directly related to the degree of risk. The company may charge as high as double the normal premium tariff for stocks stored in the open during harvest season mainly to support procurement of crops like wheat. It is therefore desirable to avoid storage in the open to minimise the insurance cost. Sometimes, it becomes inevitable, in such a situation; priority should be given to liquidate the stocks stored in the open.

The insurance companies classify stocks into three categories i.e.

- non-hazardous,
- hazardous and
- extra hazardous.

As far as possible, mixed storage should be avoided by storing each category of goods separately. In case of mixed storage insurance companies may charge a common rate for all categories of goods. This practice of avoiding mixed storage will not only reduce the chances of any mis-happening but will also help in bringing down the insurance cost.

Tariffs being levied by insurance companies for cold storage units are quite heavy for machinery breakdown and for power supply failure. As such care must be taken while constructing/ expanding cold storage units so that it has multiple chambers for storage purposes. This will help in the situation where the full capacity of the store is not being used. This will not only save electricity consumption but will also help in bringing down the insurance premium.

The business with focus on profits will always try to improve revenue and reduce cost. Increase in revenue generation is always restricted by competition. Thus, keeping costs in check is vital for profit making. Insurance cost is one of the important cost components

in the total operating cost of a warehouse. Therefore, a balanced approach is to be followed to minimise this type of cost.

The success of agri. Warehousing business depends on its ability to ensure the safety of stocks stored and offer compensation in case of any loss to the stock. It is very difficult to completely eradicate different types of risks; it is therefore advisable to avail insurance cover. The type of cover requirement should be decided carefully after understanding the likely risk environment.

## INTEXT QUESTIONS 18.4

1. State True or False

   a. Inspection is basically a system to check compliance to laid down systems.

   b. When inspection has been done, there is no need for an audit.

   c. Compliance audit involves a review of the documented quality system against the agreed standards and procedures.

   d. The frauds due to motive and rationalisation can be reduced by adequate enforcement of the management policies.

   e. Regular stock verification and audits are done at the warehouse to ensure that the physical stocks are as per records.

   f. Surprise audit should not be done as it will add to more non- conformities.

   g. The audit should review the practices followed by all suppliers down the line to ensure integrity, traceability, and security of all supplies.

   h. Different strategies are required to be used for different types of risk mitigation.

   i. Risk reduction & risk avoidance are the same.

   j. Insurance is a method of risk sharing.

2. What is the full form of GAAP?

3. Which of the following is not a function of insurance-

   a. Protection

   b. Risk reduction

   c. Risk sharing and all of these.

4. Answer in one sentence the reason behind the success of the agri warehousing business ?

## WHAT YOU HAVE LEARNT

**Warehousing is a requirement for most businesses that manufacture, import, export or transport goods.**

**Warehousing is not an unnecessary expense, but it saves you money and boost your productivity through better inventory control.**

**Insurance is a valuable tool of risk mitigation.**

**Inspection and audits are important for risk mitigation**

**Inventory management is the entire process of managing inventories from raw materials to finished products leading to Reduced Risk, Efficient planning, Better Productivity and Higher Profits.**

**SOP helps in Saving time, Safety, Efficiency and consistency, Lessor errors**

## KEY TERMS

| | | |
|---|---|---|
| Audit, | Inventory, | Insurance, |
| SOP, | Inspection, | Risks |

## TERMINAL EXERCISE

1. List 3 categories of stocks for the purpose of insuring goods.
2. Do you agree that insurance premium is based on type of godown , availability of safety, security measures.
3. List 2 levels to manage risks.
4. Which of the following relates to insurance :
    a. Risk sharing
    b. Risk reduction
    c. Risk avoidance.
5. Define inventory management
6. Inventory management is a liability. Please comment.
7. List 6 Qs for execution of the different jobs.
8. What is a Standard Operating Procedure (SOP)
9. What is a quality system audit, and how is it different from a compliance audit?
10. Why do frauds happen in the Supply Chain ?
11. Differentiate between risk reduction and risk sharing ?
12. What is Risk Assumption?
13. What is risk avoidance ?
14. What do you understand from surprise audits, is it a tool to reduce frauds ?
15. Why do we need to adopt Standard Operating Procedure, how does it help in risk mitigation?
16. What are the different types of risks in the warehouse? Discuss preventive



measures to safeguard your warehouse.What action you will take in your warehouse if theft of various items kept for storage takes place.

17. Discuss the need of insurance in risk mitigation. How and why do we need effective insurance management?

18. What you know about inspection is the same as audit. Discuss in detail about measures to be adopted in preventing frauds and minimising risks.

## ANSWERS TO INTEXT QUESTIONS

### 18.1

1. This refers to checking the health of stocks in terms of presence of insect infestation, intensity of insect population, presence of damaged, discoloured, insect-damaged or chalky grains in the sample.

2. a. Inventory management

   b physical count

   c. Sampling of grains

   d. stock levels.

### 18.2

1. Standard Operating Procedures
2. c
3. False

### 18.3

1. Misappropriation, Poor preservation, Inaccurate recording of details of goods
2. False
3. d

18.4

1.

a. True b. False c. False

d. True e. True f. False

g. True h. True i. False

j. True

2. Generally Accepted Accounting Principles .

3. b

4. The success of agri. Warehousing business depends on its ability to ensure the safety of stocks stored and offer compensation in case of any loss to the stock.

## DO AND LEARN

What do you think about the warehouse we manage without setting up a warehouse? Explain the situations if there is a theft in the warehouse, what steps are necessary to prevent it and ensure customer satisfaction.

19

# OPERATION AND HANDLING OF A WAREHOUSE

The inbound flow in a warehouse begins when items arrive in the warehouse of the company location, either received from external sources or from another company location. An employee registers the items, typically by scanning a barcode. From the receiving dock, warehouse activities are performed at different complexity levels to bring the items into the storage area.

Outbound flow is the process of storing, transporting and distributing goods to customers. The outbound process starts with a customer sales order, moves on to warehouse packing and ends with product delivery.

Inbound logistics brings supplies or materials into a business, while outbound logistics deals with moving goods and products out to customers. Both focus heavily on the transporting of goods. But inbound is all about receiving, while outbound focuses on delivery.

## LEARNING OUTCOMES

After studying this lesson the learner:

- defines the inbound and outbound operations in a warehouse;
- explains the materials management, logistics, supply chain, inventory management;
- finds the delivery process in warehouse management;
- observes the benefits of warehouse operations.

# 19.1 INBOUND AND OUTBOUND OPERATIONS IN A WAREHOUSE

## 19.1.1 Inbound operations in a warehouse

**A. Receiving of Goods in the warehouse** is the first step in inbound operations. It is carried out as

### a. Pre-receiving-

To ease the receiving process, several companies enforce receiving requirements for suppliers and carriers. The intent is receiving cargo in such a manner that it is quick and easy to process. Pre-receiving includes activities like appointment scheduling, dock/ door assignment, freight bill check.

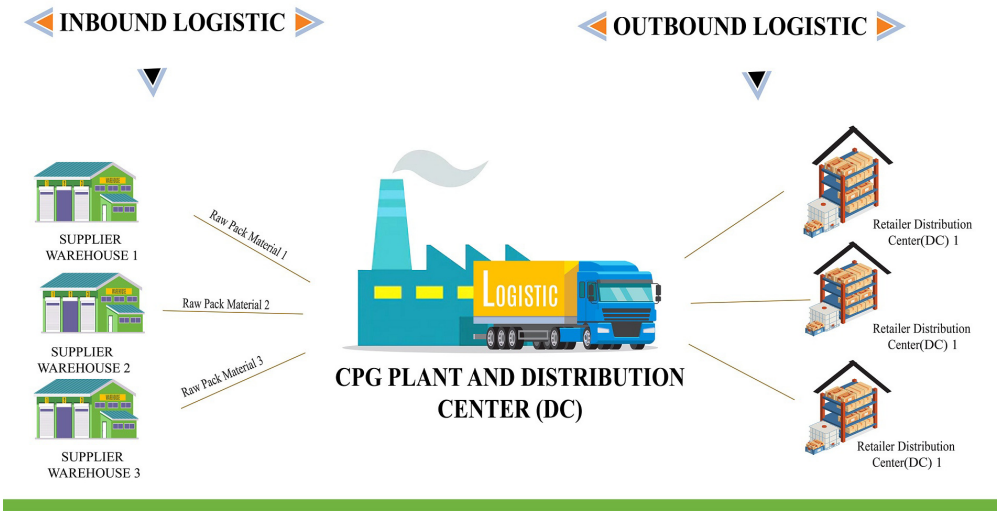



*Fig. 19.1:* **Inbound and outbound operations**

### b. Receiving -

The first step in the warehousing process is the receipt of goods. The basic functions of receiving include verifying product quality and quantity, unloading the material, moving the material to optimum storage locations, preparing receiving reports and routing those reports to designated departments. Storage functions are an extension of receiving department duties. The basic functions of storage are the movement of products from the staging area to a storage location, the recording of the location and quantity, and the updating of storage records so that the product can be found easily when it is needed. The receiving function is the starting point for inventory control in the warehouse. All essential data should be gathered at this stage, and it should be documented on the receiving reports.



## B. Verification of Documents

When the driver reports to the warehouse, he first reports with a certain set of documents. The warehouse receiving supervisor verifies the documents to check the following:

- Whether the cargo was meant for this warehouse or not.
- If the vehicle number on the documents and the vehicle number of the actual vehicle are matching.
- If the driver is carrying the entire original documents and not photocopies.
- If the driver is carrying the complete set of documents in terms of invoice, Packing list, E-way and other documents.

The transport document verification process ensures that the cargo being unloaded is meant for this warehouse and is carrying complete and original documents for the next steps to follow.

## C. Unloading of material

The objective of the unloading process is to unload cargo safely and efficiently. This process includes:

- Checking seals of the vehicle
- Validating the number or booking reference.
- Checking temperature data in case of perishable goods being received.
- Allocating a bay for the vehicle
- Assign labour team to unload
- Assign proper equipment to unload.
- Assign Forklift in case of Palletized cargo to be unloaded.

When unloading the cargo, safety is as important as speed of unloading. All precautions have to be taken to ensure safety of the people operating and security of the cargo being unloaded.

### a. Physical Verification of Material

The next step in the receiving process is to conduct a standard verification process that includes:

- Checking of Quantity received,

- Description of goods,
- Product Code.
- Batch/Lot number,
- Temperature in case of temperature controlled cargo
- Labelling, Weight of the cargo and Condition cargo-whether damaged or not.

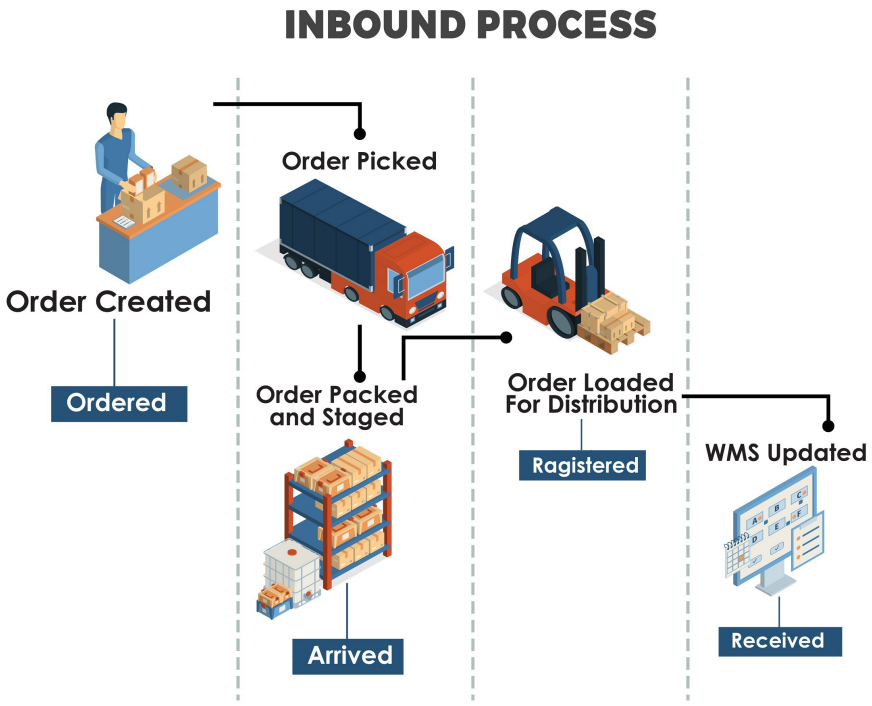



*Fig. 19.2:* **Inbound Process**

A critical part of the verification process is to record and report any discrepancies between what is expected and what is received. The use of warehouse technology such as barcode scanners or RFID integrated with the Warehouse Management System (WMS) is helpful to speed up counting and reduce errors. Another approach to speeding up the process is to conduct random checks.

One of the most time-consuming, labour-intensive and critical tasks is counting and verifying damaged cargo. It is essential to keep a record of all missing and damaged cargo and its supplier and carrier. Once data has been collected, receiving supervisors will use this data to make these companies, suppliers and carriers aware of the problem.



On the other hand, for warehouses required verifying weight and dimensions, weighing scales integrated with packet/pallet dimensioning systems and the warehouse management system are an excellent option for capturing all this information quickly and without errors.

## D. Inspection of Quality of Material

Quality of the material is critical for both customer experience and manufacturing process. When the Finished goods are delivered to the final customer no company can afford a damaged or defective product. Similarly, during the manufacturing process, the Raw Material and parts have to be of the right quality and specifications to ensure the right final product. The inspection of the material at the warehouse involves following steps:

- Visual inspection of the goods to check for any dents, damages, leaks of the incoming products. In case of packaged products to check if the packaging is proper and not mutilated.
- In case the products are received in large numbers, random samples may be drawn. These samples may be visually checked or deeply tested based on the policies of the company.
- In case of rejection, the products may be returned to the supplier or reworked inside the warehouse based on the possibility and criticality of the material. In certain cases, poor quality may lead to credit notes from the supplier as a compensation for poor quality.

## E. Issue of warehouse Receipt - GRN

Goods Receipt Note (GRN) is an important document evidencing receipt of the material at the warehouse. It is issued by the warehouse or Stores confirming the SKU and quantity received. The GRN is generally done against the Purchase Order issued to a supplier. GRN is used by the Purchase Department to keep a tab of the quantity received against each PO issued by them. It is used by the Accounting team to make payments to suppliers against their invoices. GRN allows the updation of inventory in the stock ledger so that it can be used for further dispatch planning.

## F. Physical Putaway to Storage location

The goods received need to be physically moved and stored at the storage location. This process is called Put-away process. On the receipt of the material a Put-away list is created listing the number of SKU and their quantity to be stored. The Put-away list also carries the storage location where the material needs to be stored. The storage location

can be determined by the system when WMS is being used or can be manually fed when WMS is not being used.

## G. Exception Management

As discussed, the receiving process is the key to efficiency and productivity of the warehouse. Any exception to this process needs to be dealt with on an immediate basis. There could be various kinds to exception which could happen during the process

- Material arriving without an ASN.
- The incoming vehicle is not carrying the complete set of documents.
- The quantity on the documents and physical quantity not matching.
- The product was damaged.
- The goods were not properly labelled.
- Warehouse labour or equipment not available.
- Bunching of large incoming shipments.
- Warehouse running short of storage space.

## H. Advance shipment notice (ASN)

An Advanced Shipping Notice (ASN) is an important electronic data information tool which keeps the buyer informed, allows them to track the shipments, allows them to plan for their inventory and helps to improve the relation of the supplier and buyer. ASN simple yet powerful tool to reduce the customer service efforts and highly recommended for all progressive and professional companies. What Does an ASN Include?

- Material being shipped.
- The product description and code.
- The quantity of the shipment.
- Physical characteristics like weight, number of packages.
- The date of shipment
- The expected date and time of delivery.
- The details of the vehicle and the carrier.
- Pallet codes if required



## I. Inbound Quality Inspection

The quality department will provide the warehouse with instructions on how to deal with incoming materials. Not all parts incoming shipments need to be inspected. Some low cost standard items may not require inspection at the time of receipt. However, for many items used in the production line, the part or raw material will be subject to inspection.

a. **Visual Inspection:** The incoming pallet may be damaged from the side, the received white goods may be dented during transit, and the drum carrying chemicals may be leaking. Such items should be rejected immediately on unloading.Packaged items may be rejected if the packaging is damaged.

b. **Sampling:** In case a large quantity of the particular parts or material arrives at the warehouse, not every part needs to be checked. The quality department generally instructs to do a random sampling and only the samples to be checked.

c. **Failing Inspection:** Some products that are received at the plant may fail either the initial visual inspection or testing by the quality department.Return the shipment to the supplier for him to replace the defective items. This is possible when the items are available with the suppliers and quick turnaround is possible.

## J. Put-Away Process

The prime objective of the put-away process is to move goods from the dock to the most optimal warehouse storage location. Put away process needs to ensure that:

- Material is stored quickly and efficiently
- The material is easy to locate for any physical count of the inventory.
- The travel distance in the warehouse from staging area to storage area is reduced to a minimum.
- Ensuring the safety of the people working in the warehouse and safety of the goods.
- At the time of picking, material is easy to locate and identify.
- Maximisation of the storage space utilisation in the warehouse.

Any failure in the put-away process can have a direct impact on the operations and lead to poor productivity of the warehouse. Put-away refers to a series of activities from initial receipt of stock until it is finally stocked at the destination. Put-away list helps to complete the process. The Put-away list consists of the list of items to be stored, their quantity and suggested bin locations.



### 19.1.2 Outbound operations in a warehouse

Outbound operation covers the process where goods are stored, moved, and distributed for delivery to customers. Dispatch of goods from a warehouse is the most fundamental job and is known as outbound operations in a warehouse. The dispatch process can be divided into four stages as under:

#### A. Order Processing

The outbound process begins with an order. This could be a sales order (SO) or a stock transfer order or a material requisition to the feeding line. The sales order will typically specify the SKU required by the customer and the quantities for each of them. The SO are generally processed by the Finance team which checks if the payment is received from the buyer or is there enough credit limit available. Once the SO has been processed and cleared in the system all the subsequent process of picking and dispatching starts. The Sales order processing also allows the sale invoices to be generated which accompany the goods during transit. Though in most of the cases the Sales Orders are processed not at the warehouse. There is a backend team which processes the Customer orders. However, in certain cases the ware-house team may be allowed to process the sales orders. In such cases, the customer purchase directly flows to the warehouse and warehouse processes the Sales Orders based on the material availability.

#### B. Picking and Pick List

Picking is an extremely important warehousing process. This stage drives the productivity of the whole dispatch and ordering process and makes it one of the most critical processes in supply chain management. The first decision in the picking is the decision to decide the methodology of processing the orders. There are two broad ways to achieve this: Discrete Order Picking and Batch Picking. There are two more methods of picking: Wave Picking and Zone Picking. Following are some of the other factors to be considered in determining the right picking system

- The pick location assigned to each product should be based on the 80/20 rule. This means that fast-moving products should be in picking locations that hold more stock.
- You should be able to move a product into or out of its picking location easily as the level of its activity moves up or down over time.
- The physical setup of the picking system should minimise the travel time of the pickers whenever possible. The same is true with the method of picking used.

- The picking method should minimise the number of times the products must be handled before they are placed into the final cartons used for shipping.

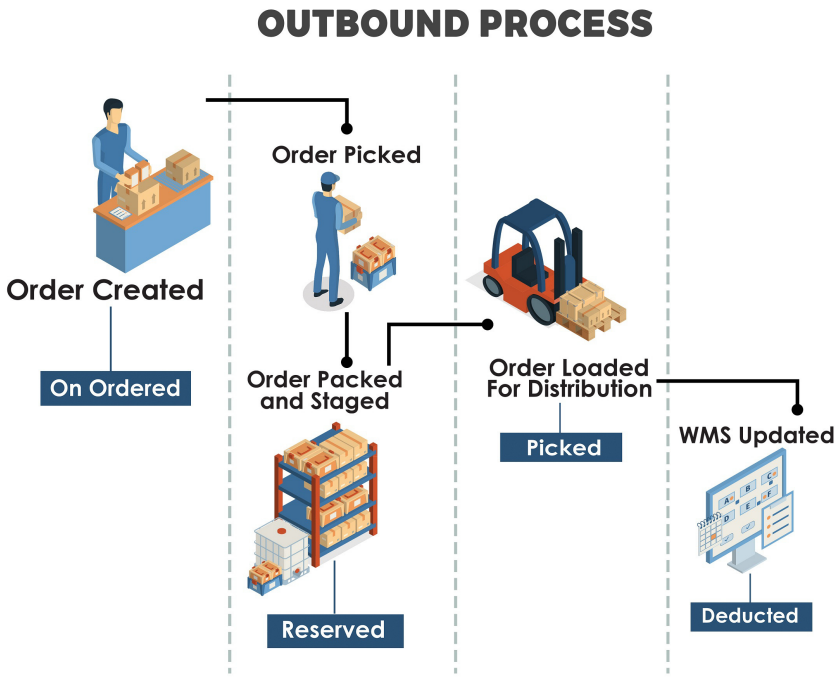



*Fig. 19.3:* **Outbound Process**

**C. Packing -** The goods once picked need to be packed before delivering to the final customer. In case of batch picking, the packing stage also allows checking the accuracy of the picking process. The product is packed into shipping cartons. The air space if any is filled with packing material like thermocol, airbags or shredded paper. The shipping cartons may be shrink wrapped or strapped. The cartons are labelled, stamped and marked.Returns from the customer should be closely monitored to find the returns related to poor packing and the process should be improved accordingly.

**D. Shipping**

Shipping is the last stage of dispatch, where the cargo is prepared for the requested made of transit. The tasks performed usually include weighing each carton, labelling the carton, recording shipment information in a manifest system, and applying address labels generated by the manifest system. The packages may be sorted based on different modes of transport, or based on different carriers or based on different destinations. The carriers are invited and they pick up the shipment assigned to them. The carrier person also counts the packages assigned to him and tallied with the delivery note or the invoice.

It is usually considered shipping's responsibility to ensure that all shipments are picked up the day they are ready to ship and that all shipping paperwork is routed to the correct departments at the end of each shipping day.The successful art of dispatch lies in the operation's ability to have goods ready for departure, just in time for carriers to load their trucks. The DC manager must therefore balance and forecast packing and dispatching according to carrier pick-up times. Goods that are ready too early, for example, will clutter staging areas, while dispatches that are late, will delay loading and potentially cause late deliveries.

## E. Warehouse document checklist

The following dispatch documents should be maintained (in chronological order) and made avail-able for inspection by monitors, program management, and auditors.As these documents are used to develop many management and financial reports, procedures should be in place for adequately safeguarding them against improper access and loss.Warehouse dispatch document checklist.

- Dispatch invoice/Delivery challan /Dispatch Note
- Dispatch waybills
- Tally sheets (loading)
- Warehouse inspection reports
- Lorry Receipts from the Transporters/Bill of Lading for Sea / Airway Bill for Air

The put away process includes putting goods away in a storage area in the warehouse. There are put away strategies in the Warehouse Management (WM) system that simplifies the search for appropriate storage areas. Put away list helps to control the put away process and assist to identify the minimum flow path. The storage location for any put away can either be decided using the functionality of WMS or manually decided. It is imperative to label all the storage locations in the warehouse. WMS cannot work without location labelling. The location numbers help in put away, picking, stock take and various audits.

The very purpose of the warehouse is to fulfil the customer orders. Warehouse dispatching is the most important part of the warehouse operations. The dispatching process starts with receipt and processing of customer orders. The sales order is translated into a picking list. There are various strategies for picking the material. The warehouse may choose the one best suited for them. The product picked is packed and prepared for the carrier to pick up. The documentation in the dispatch process is extremely critical and needs to be preserved for future reference and audits.



Handling of the inbound and outbound operations in warehouse prerequisites to have an idea of various practical aspects which are dealt in a brief manner below

## INTEXT QUESTIONS 19.1

1. Define warehousing?
2. _____ is an outbound activity in warehouses
   a. Delivery
   b. Receiving
   c. Put away
   d. Pre-receiving

## 19.2 MATERIALS MANAGEMENT

### 19.2.1 Materials management

It is a subset of warehouse management dealing exclusively with material which contributes the maximum to completion of the end product. The objectives of material management are as follows:

- Lower the price of the raw materials.
- Reduce the cost of production and ensure the smooth flow of production.
- Maintain quality of raw material as well as finished goods.
- Maintain good relations with the supplier as to ensure a smooth flow of raw materials.
- Continuous improvement of the skill set of the workers thereby increasing overall efficiency within the organisation.

### 19.2.2 Supply chain

As per definition SCM is the management of a network of all business processes and activities involving procurement of raw materials, manufacturing and distribution management of Finished Goods. SCM is also called the art of management of providing

the Right Product, At the Right Time, Right Place and at the Right Cost to the Customer.

Supply Chain Management encompasses, planning, design, control and implementation of all business processes related to procurement, manufacturing, distribution and sales order fulfilment functions of a business. All these activities involve multiple networks of vendors and service providers which are integrated and co-coordinated by the Supply Chain Experts of the organisation to move raw materials and finished goods from and to all distant locations across the globe.

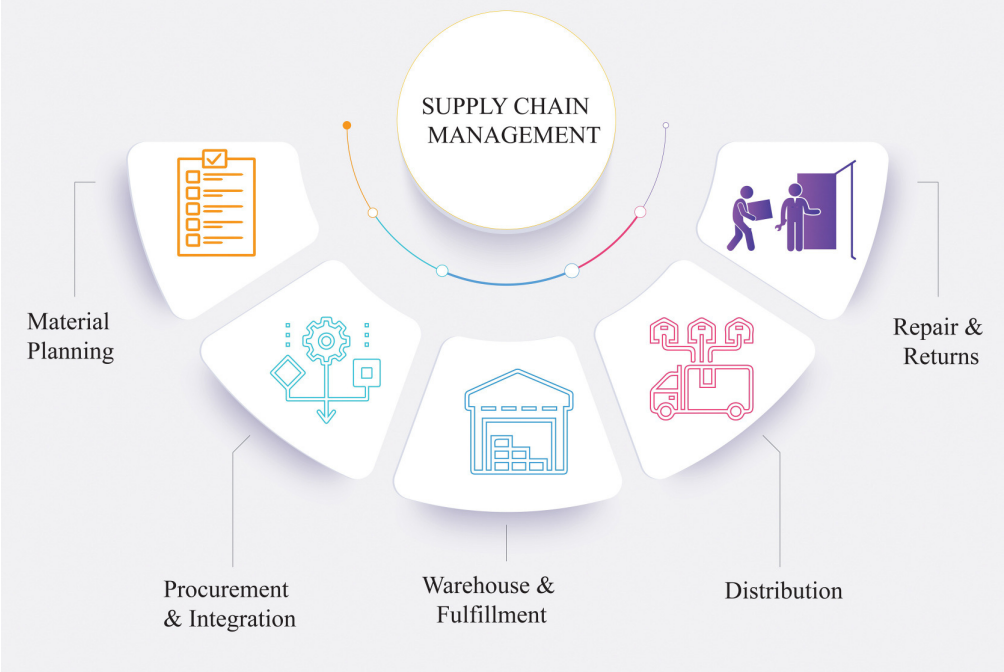



*Fig. 19.4:* **Supply Chain Management**

### 19.2.3 Logistics

Logistics is the backbone on which Supply Chains are driven. Logistics refers to the management of the flow of goods and supplies involving information, data and documentation between two entities or points. Logistics plays an important role in the post procurement function of delivery of raw material from the supplier to the point of production and Finished Goods from the point of dispatch from factory to the point of delivery to the customer. The goods flow through a network of transportation by road, rail, air or ship and intermediary warehouses to hold inventories before moving to the forward locations. The entire activity involves multi-tier suppliers, agents, and agencies including freight forwarders, packers, customs department, distributors and Logistics service providers, etc.

Take the case of production procurement, SCM strategy will define the process, selection of vendors, procurement strategy and the mode of order fulfilment coupled with cycle time and lead time to supply to the production floor. Logistics in this case details out the mode of transportation from the vendor, the consignment planning, process for order trigger, consolidation of shipments, detailing transportation modes and vendors, defines transit times, documentation process and implements the plan, controls and monitors the flow of goods from point of origin up to the point of delivery to the plant for production.

In the case of Finished Goods distribution, SCM strategy will define overall network design for stock holding and other channels of distribution. Logistics deals with the entire gamut of designing transportation network, partnering with 3rd party logistics providers to establish distribution centres and warehouses, planning inventory management and operations process including packing, promotional bundling, etc., primary, secondary distribution network and vendors and at the end the complete documentation and information process for the entire chain of activities

### 19.2.4 Inventory

Inventory is an idle stock of physical goods that contain economic value, and are held in various forms by an organisation in its custody awaiting packing, processing, transformation, use or sale in a future point of time. Any organisation which is into production, trading, sale and service of a product will necessarily hold stock of various physical resources to aid in future consumption and sale. While inventory is a necessary evil of any such business, it may be noted that the organisations hold inventories for various reasons, which include speculative purposes, functional purposes, physical necessities etc.

A manufacturing organisation holds inventory of raw materials and consumables required for production. It also holds inventory of semi-finished goods at various stages in the plant with various departments. Finished goods inventory is held at plant and at various stocking points or with dealers and stockist until it reaches the market and end customers. Besides Raw materials and finished goods, organisations also hold inventories of spare parts to service the products. Defective products, defective parts and scrap also form a part of inventory as long as these items are inventoried in the books of the company and have economic value.

*Table 19.1:* **Types of Inventories by Function**

| INPUT | PROCESS | OUTPUT |
|---|---|---|
| Raw Materials | Work In Process | Finished Goods |
| Consumables required for processing. Eg : Fuel, Stationary, Bolts & Nuts etc. required in manufacturing | Semi Finished Production in various stages, lying with various departments like Production, WIP Stores, QC, Final Assembly, Paint Shop, Packing, Outbound Store etc. | Finished Goods at Distribution Centres throughout Supply Chain |
| Maintenance Items/ Consumables | Production Waste and Scrap | Finished Goods in transit |
| Packing Materials | Rejections and Defectives | Finished Goods with Stockist and Dealers |
| Local purchased Items required for production | | Spare Parts Stocks & Bought Out items |
| | | Defectives, Rejects and Sales Returns |
| | | Repaired Stock and Parts |
| | | Sales Promotion & Sample Stocks |

### 19.2.5 Delivery process

**Warehouse Shipping or Delivery-** There is three basic shipping process steps used in a warehouse:

- Aggregate and manage order information: This step involves getting the order information, validating addresses, confirming inventory availability, combining



orders going to the same address (or separating orders going to different addresses) and preparing the order for shipment.

- Pick, pack, weigh, and choose carrier and label: This is the process of picking and packing the products ordered, weighing the shipment, choosing the right carrier and labelling the package for delivery to the end customer's address.
- Ship the order: Shipping involves transferring the package to the selected carrier and updating the shipping information to all parties.

## Common Shipping Issues

- Inventory shortages
- Storage and retrieval inefficiencies
- Cost-related problems
- Human errors
- Health and safety hazards
- Warehouse layout issues

Each issue has a solution. For example, to avoid inventory shortages, a warehouse needs to have a system that promotes constant checking and updating of inventory in real time.

If storage and retrieval inefficiencies are a problem, a warehouse may need additional workers or more reliable equipment. Using robotics and automation can also help improve accuracy, reduce human error and eliminate labour shortages.

To solve cost-related problems, shippers need to research all possible shipping methods and the associated costs. Transportation costs are always in flux, so it's important to stay up to date to ensure you get the best value.

Warehouse layout issues and health and safety hazards go hand in hand. If warehouse space isn't allocated properly, it will have a negative impact on the fluidity of the shipping process. Keeping things clean, organised and clearly labelled also goes a long way to making a warehouse a safer place to work. With warehousing best practices in mind, implementation and routine review, one can improve the performance of the warehouse shipping operations dramatically.

## INTEXT QUESTIONS 19.2

1. Define supply chain
2. The objectives of material management do not include
   a. Increase in the price of the raw materials.
   b. Reduce the cost of production and ensure the smooth flow of production.
   c. Maintain quality of raw material as well as finished goods.
   d. Maintain good relations with the supplier as to ensure a smooth flow of raw materials.

## 19.3 BENEFITS OF INBOUND AND OUTBOUND OPERATIONS

Inbound operations provide these benefits:

- Better inventory management, lower inventory levels, reduced carrying costs.
- Improved on-time deliveries.
- Less handling and damage, efficient receiving.
- Proactive notification of disruptions.
- Administrative efficiency.
- Increased customer satisfaction.

### A. Outbound operation benefits

Here are some tangible benefits of outbound logistics operations on the quality of delivery:

- Improved delivery speed. 63% of today's online shoppers expect three-day delivery for domestic shipments as a standard.
- Businesses with well-optimised outbound logistics choose the most efficient routes for all their deliveries, taking into consideration factors like vehicle capacity, location, and moreOn-time deliveries.
- Outbound logistics also plays a significant role in customer satisfaction.In fact, 45% of consumers are unlikely to continue shopping from a business if they

experienced a late delivery. While 40.5% of online shoppers prefer e-commerce stores that offer free shipping. Consumers expect fast and creative delivery options, as well as real-time information about the status of their order.

## B. Difference between the two operations

Although both types focus on the transportation of items, there are some significant differences between inbound and outbound logistics.

***Table 19.2:*** **Difference between Outbound and Inbound Logistics**

| ATTRIBUTE | INBOUND LOGISTICS | OUTBOUND LOGISTICS |
|---|---|---|
| Direction | Inward | Outward |
| Focus | Supply | Demand |
| Role | Receiving | Delivery |
| Key Relationships | Suppliers, vendors and their distributors | Distributors, wholesalers, retailers, end customers |
| Processes | Sourcing, procurement, materials handling, putaway | Inventory management, order fulfilment, shipping |
| Activity | Raw materials or goods coming in from suppliers | Finished products going out to customers |
| Strategic Imperative | Obtaining goods or materials the company needs to make its products | Meeting customer demand, supporting the sales process to generate revenue |

Inbound logistics deals with the purchase, storage, and transportation of goods to the company's production facility, while outbound logistics deals with order preparation and distribution of packages to consumers. While inbound logistics is focused on raw materials sourcing, outbound logistics handles customer service and product distribution channels. With inbound logistics, the company interacts with suppliers, while in outbound logistics, the interaction happens between the company and its clients. Although different, upstream and downstream logistics work together, each maintaining its own role within the supply chain or delivery logistics.

## C. Handling operations in a warehouse in an efficient manner

All the operations in a warehouse are efficiently carried out when the following strategies are considered

- Analyse picking methodology
- Communicate effectively with workers.
- Consider incentives for workers.
- Implement custom kitting strategies.
- Improve employee comfort.
- Invest in quality equipment.
- Measure and communicate the right metrics.
- Minimise errors.
- Purchase and install newer equipment.
- Schedule maintenance plans.
- Systematise workstations.

## INTEXT QUESTIONS 19.3

1. Give the major benefits of inbound operations?
2. What is the difference between inbound and outbound operations
3. _____ is a tangible benefit of outbound operations

   a. Improved delivery speed

   b. More cancelled orders

   c. Selection of Long routes

   d. Improper loading



## WHAT YOU HAVE LEARNT

### Inbound flow

The inbound flow in a warehouse begins when items arrive in the warehouse of the company location, either received from external sources or from another company location.

### Outbound flow

Outbound flow is the process of storing, transporting and distributing goods to customers. The outbound process starts with a customer sales order, moves on to warehouse packing and ends with product delivery.

### Receiving

The first step in the warehousing process is the receipt of goods. The basic functions of receiving include verifying product quality and quantity, unloading the material, moving the material to optimum storage locations, preparing receiving reports and routing those reports to designated departments.

### Goods Receipt Note

Goods Receipt Note (GRN) is an important document evidencing receipt of the material at the warehouse. It is issued by the warehouse or Stores confirming the SKU and quantity received.

### Put-away

The goods received need to be physically moved and stored at the storage location. This process is called Put-away process.

### Advanced Shipping Notice

An Advanced Shipping Notice (ASN) is an important electronic data information tool which keeps the buyer informed, allows them to track the shipments, allows them to plan for their inventory and helps to improve the relation of the supplier and buyer

### Picking system

The physical setup of the picking system should minimise the travel time of the pickers whenever possible. The same is true with the method of picking used.

**Shipping**

Shipping is the last stage of dispatch, where the cargo is prepared for the requested mode of transit.

**SCM**

SCM is the management of a network of all business processes and activities involving procurement of raw materials, manufacturing and distribution management of Finished Goods.

**Logistics**

Logistics refers to the management of the flow of goods and supplies involving information, data and documentation between two entities or points

**Inventory**

Inventory is an idle stock of physical goods that contain economic value, and are held in various forms by an organisation in its custody awaiting packing, processing, transformation, use or sale in a future point of time.

## KEY TERMS

| | | |
|---|---|---|
| Warehouse | Materials management | Inbound operations |
| Outbound operations | Inventory | Supply chain |
| Receiving | Picking | Packing |
| Shipping / Delivery | | |

## TERMINAL EXERCISE

1. Define inbound operations
2. Define outbound operations
3. What is logistics



4. What is materials management
5. Explain the Inventory types
6. What is the GRN?
7. What are the picking types?
8. Explain consolidation
9. What is the difference between inbound and outbound operations
10. What is an advanced shipment notice?
11. What do you mean by Put-away?
12. How to perform inbound and outbound operations efficiently in a warehouse
13. How to decide the inventory, supply chain, logistics and delivery process in warehouse
14. What kind or types of benefits accrue from the warehouse operations
15. Give the process for performing warehouse operations in a flawless manner
16. Describe Receiving Procedure in warehouse.

## ANSWERS TO INTEXT QUESTIONS

### 19.1

1. Warehousing is a set of activities that are involved in receiving and storing of goods and preparing them for reshipment
2. Choice a.

### 19.2

1. Supply Chain Management encompasses, planning, design, control and implementation of all business processes related to procurement, manufacturing, distribution and sales order fulfilment functions of a business.
2. Choice a.

19.3

1. Better inventory management, lower inventory levels, reduced carrying costs.
2. Choice a.

## DO AND LEARN

Take the examples of agriculture goods and electronic goods that need the warehouse utilisation. Make two groups of your class and find out how the warehouse operations like inbound and outbound activities are to be performed in the warehouse for the two types of goods selected. Find the difference in handling these goods.

## ROLE PLAY

Surendran is a trader who handles spices for his business and he utilises the warehouse facility for his business. One of his friend cum farmer, Nagaraj who grows tea in coonoor wants to get his expertise for using warehouse facilities. Here is the conversation of them

Nagaraj: Dear Surendran I know you store your spices in warehouse and I would like to know the details

Surendran: welcome, Nagaraj, I will share with you the process involved including the costs so that you also could use the warehouse facility

Nagaraj: Can I store the produce for six months

Surendran: Yes it all depends on your requirement, since there will be demand supply mismatch during the peak season as demand drops and supply booms, the warehouse facility could be very essential for the products we deal with.

Put yourself in the place of Surendran and your friend in the place of Nagaraj and continue discussion

20

# NEED FOR PHYSICAL DISTRIBUTION IN WAREHOUSE

A good distribution system quite simply means the company has a greater chance of selling its products than its competitors. A company that spreads its products wider and faster into the marketplace at lower costs than its competitors will make greater margins absorb raw material prices rise better and last longer in tough market conditions. The best price product, promotion, and people come to nothing if the product is not available for sale at the points at which consumers can buy. In the FMCG industry in India, companies distribute their low-value, high-volume products to over 1 million retail outlets or points of sale. Generally, if there are more intermediaries involved in the distribution channel, the price of a good may increase. Conversely, a direct or short channel may mean lower costs for consumers because they are buying directly from the manufacturer.

## LEARNING OUTCOMES

After studying this lesson the learner:

- defines the meaning of physical distribution in warehouse;
- identifies the need for physical distribution in warehouse;
- lists the components of physical distribution;
- organizes the marketing forces affecting distribution in warehousing.

## 20.1 DISTRIBUTION

Distribution means to spread the product throughout the marketplace such that a large number of people can buy it. Distribution involves doing the following things:

1. A good transport system to take the goods into different geographical areas.

2. A good tracking system so that the right goods reach at the right time in the right quantity.

3. A good packaging, which takes the wear and tear of transport.

4. Tracking the places where the product can be placed such that there is a maximum opportunity to buy it.

5. It also involves a system to take back goods from the trade.

### 20.1.1 Physical Distribution

Physical distribution is the set of activities concerned with efficient movement of finished goods from the end of the production operation to the consumer. Physical distribution includes all the activities associated with the supply of finished product at every step from the production line to the consumers. Important physical distribution functions include customer service, order processing, inventory control transportation and logistics, and packaging of materials.

"Physical distribution involves planning, implementing and controlling the physical flow of materials and final goods from the point of origin of use to meet consumer needs at a profit."

"Physical distribution involves the management of physical flow of products and establishment and operation of flow systems."

Physical distribution is thus, management of the physical flow of products and management and operation of the flow system. It is a process of managing the movement of the goods. Accounting for nearly half of the entire marketing budget of products, the physical distribution process typically garnishes a lot of attention from business managers and owners. As a result, these activities are often the focus process improvement and cost saving initiatives in many companies.

This chapter introduces students to the concept of physical distribution, its need, mechanisms and factors affecting it. What are channels of distribution, their function, type and how to select the right ones?

### 20.1.2 Definition

"Physical distribution involves planning, implementing and controlling the physical flow of materials and final goods from the point of origin of use to meet consumer needs at a profit."

Rodrigue and Hesse write "Physical distribution includes all the functions of movement



and handling of goods, particularly transportation services (trucking, freight rail, air freight, inland waterways, marine shipping, and pipelines), transshipment and warehousing services (e.g. consignment, storage, inventory management), trade, wholesale and, in principle, retail".

According to William J. Stanton, "Physical distribution involves the management of physical flow of products and establishment and operation of flow systems."Physical distribution is thus, management of the physical flow of products and management and operation of the flow system. It is a process of managing the movement of the goods.

Stephen Davis - "A product with better distribution will always win over a superior product with poor distribution or customer access. It's not fair. It's not right. But it's reality".

Physical distribution and the ability to get a product to a consumer quickly and economically has a direct impact on customer satisfaction. By storing goods in convenient locations, and by creating fast, reliable means of moving those goods, small business owners can help assure continued success in a rapidly changing, competitive global market.It includes all those activities which help in efficient movement of goods from producer to consumer, such as transportation, warehousing, material handling, inventory control, order processing, market forecasting, packaging, plant and warehouse location and customer service.

### 20.1.3 Objectives of Physical Distribution

Physical distribution has two broad objectives viz. consumer satisfaction and profit maximization. Apart from these, there are other objectives too. A satisfied consumer is the biggest asset that a company has. A firm can provide satisfaction to consumers by making available the right quantity of the right goods at the right place and time, at lowest costs. Prompt and dependable distribution enhances consumer satisfaction.

At the same time, by offering better service at a lower price of the product, the firm can attract additional consumers and make more profits. This can be done by improving the efficiency and effectiveness of physical distribution activities, firms can bring in an economy which will have an effect on profit margin i.e. by lowering the physical distribution costs, profit position can be improved.

Apart from these two broad objectives, physical distribution has other objectives as follows:

- To make available the right goods in the right quantity at the right time and right place at least cost.
- To achieve minimum inventory level and speedier transportation.

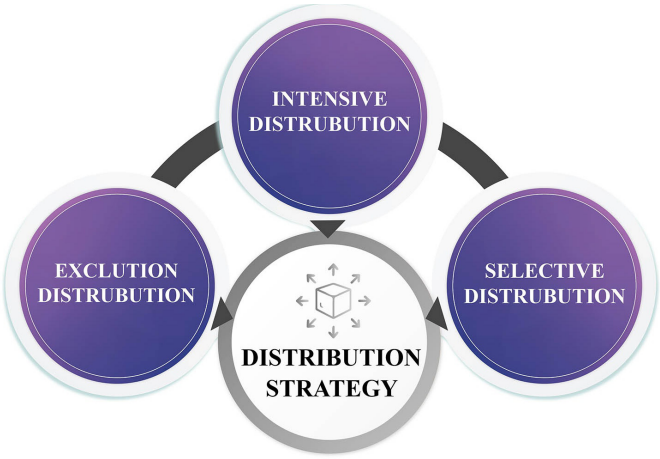
- To establish the price of products by effective management of physical distribution activities.
- To gain competitive advantage over rivals by performing customer service more effectively.

### 20.1.4 Distribution Strategies

Distribution is the process of making your embedded system available for use by a consumer or a business. Distribution can use either direct or indirect means to put the systems into the customer's hand. Indirect means employ channels, which are separate but interdependent companies that work together to supply the product to the customer. Table 1 defines three different strategies of distribution; you will probably use either selective or exclusive distribution to deliver your embedded systems to customers.

***Table 20.1:*** **Types of distribution**

| Distribution Type | Definition |
|---|---|
| Intensive | Generally, retail where products stock in many outlets, e.g., snack foods or magazines |
| Selective | Manufacturer uses only a few intermediaries to distribute product, e.g., appliances |
| Exclusive | Manufacturer uses only one reseller/distributor or sells directly to customers |




The use of various channels in each type of distribution will be dealt more in the next lesson on channels of distribution.



## INTEXT QUESTIONS 20.1

1. Define distribution?
2. What do you mean by physical distribution?
3. _____ is a form of distribution
   a. selective
   b. formal
   c. truck
   d. inclusive

## 20.2. NEED FOR PHYSICAL DISTRIBUTION

### 1. Creating Time and Place Utility:

Physical distribution activities help in creating time and place utility. This is done through transportation and warehousing. Transportation system creates place utility and makes available the goods at the right place where they are required. Warehousing creates time utility by storing the goods and releasing them when they are required.

### 2. Helps in Reducing Distribution Cost:

Physical distribution costs account for a major part of the price of the product. If these costs are handled systematically, decrease in costs of product can be there. Proper and systematic planning of transportation schedules and routes, warehousing location and operation, material handling, order processing, etc. can easily bring in cost economies.

### 3. Helps in Stabilization of Price:

Physical distribution helps in maintaining stable prices. Even customers expect price stability over a period of time, Proper use of transportation and warehousing facilities can help in matching demand with supply and thus ensure stabilisation of price.

### 4. Improved Consumer Services:

Consumer service in physical distribution means making products in the right quantity available at the right time and right place i.e. place where customer needs.

Physical distribution is important because it comprises the final steps a business takes before

they put their product in the hands of their customer. That's why so many businesses invest in a third-party logistics provider to ensure their physical distribution is handled with care.

The importance of physical distribution to a company can vary and is typically associated with the type of product and the necessity it has to customer satisfaction. Strategically staging products in locations to support order shipments and coming up with a rapid and consistent manner to move the product enables companies to be successful in dynamic markets.

### 20.2.1 Role for Physical Distribution

Distribution is one of the important marketing mixes. Delivery of satisfaction, standard of living, value addition, communication, employment, efficiency and finance are the major roles and importance of distribution. The distribution of goods is very important to the continuous survival of any company. The role and importance of distribution in marketing and in the whole economy can be discussed as follows:

#### 1. Delivery of satisfaction

Marketing concept emphasizes on earning profit through satisfaction of the customers. Besides market research for the development and sales of goods according to the needs and wants of consumers, the participants of the distribution channel also help producers in production of new goods.

#### 2. Standard of living

Distribution function helps to improve the living standard of the consumers in the society. Proper distribution of necessary goods and services to the consumers easily at the right time does not only satisfy them but also brings change in their living standard. Distribution brings improvement in living standard of consumers through generation of employment, increase in income and transfer of ownership. Hence, it brings positive effects in society.

#### 3. Value addition

The functions of distribution such as transportation, warehousing, inventory management etc. increase the importance of products by creating place utility, time utility and quantity utility. Distribution mix plays an important role to increase the value of the products through delivery of goods in the right quantity, at the right place and at the right time.

#### 4. Communication

Distribution serves as a link between producers and consumers. Producers can make a flow of information and messages to consumers about their products, price, promotion



etc. through channel members. Similarly, they receive information about customers, competitors and environmental changes from channel members.

### 5. Employment

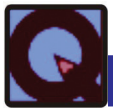
The function of distribution creates employment opportunities in society. Market intermediaries work as direct and indirect sources of employment. Different producers need to supply their innumerable products to consumers. Thousands of distributors, agents, wholesalers, retailers, brokers etc. involved in supplying the products to the consumers. Similarly, many people of the society can get jobs in the transport and warehouses sectors, etc.

### 6. Efficiency

Producers produce limited types of goods in mass quantities but the consumers demand different types of goods in small quantities. When goods are produced in a mass quantity, they can be obtained at a lower price. Distribution helps to satisfy the needs of consumers by supplying an assortment of different products of different producers. From this, efficiency can be achieved in both production and distribution.

### 7. Financing

Intermediaries themselves make arrangements to keep reserves and stock of goods. The producers need not make arrangements and manage distribution centers and warehouses. The producers need not do anything except remain busy in production, the timely payment by intermediaries and financial help become more important for smooth operation of production. Similarly, the role of finance is also decisive in mobilizing other means of production.



## INTEXT QUESTIONS 20.2

1. What is the need for physical distribution?
2. What is the role of physical distribution?
3. _____ brings positive effect in society
   a. Distribution
   b. Transport
   c. Place
   d. utility

## 20.3 COMPONENTS OF PHYSICAL DISTRIBUTION

### 1. Order Processing

Order processing is the starting point of any distribution activity. Order processing includes activities like receiving the order, handling the order, granting credit. Invoicing, dispatching, collecting bills, etc. Each customer expects that the order placed by him is implemented without delay, and as per the specifications of the order.

Thus, order processing becomes very important. Marketers should make an effort to maintain the order cycle time i.e. the time period between the time of placement of an order by the customer to the time of arrival of goods at his destination. Standard procedure should be laid down for processing of order.

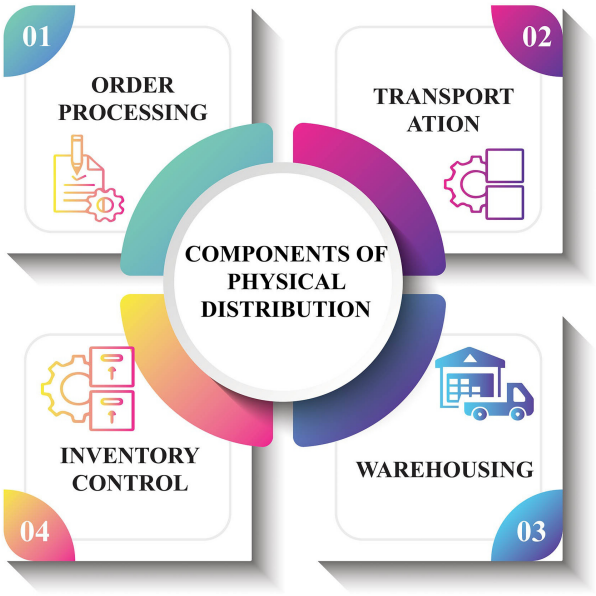



*Fig. 20.1:* **Components of physical distribution**

### 2. Storage and Warehousing

Storage means making proper arrangements for retaining the goods in proper condition till they are demanded by customers. There are many products which are seasonally produced but are used throughout the year, they can be stored and later released.

Similarly, there are products which are produced throughout the year but are seasonally used like umbrellas, fans, heaters, etc. Here also storing plays an important role. Storage reduces the need for instant transportation which is difficult and costly.

Warehousing provides the storage function. Places where the goods are stored are known as warehouses. Goods are stored in warehouses to be released in time of demand.



Apart from storing functions, warehouses also perform other functions like, marketing and assembling the goods.

Two types of warehouses are there- Storage Warehouses and Distribution Warehouses. Storage warehouse helps in storing the goods for a long and medium period of time to ensure matching of supply and demand. Distribution warehouses facilitate assembling the product and redistributing it within a short period of time. They can also be centralized (when located near a factory) or decentralized (when located near a market).

### 3. Inventory Control

Inventory control refers to efficient control of goods stored in warehouses. Maintaining an adequate level of inventory is very essential for smooth flow of business. Inventory acts as a bridge between the orders of customers and production. They are the reservoir of the goods held in anticipation of sales. Therefore, it needs to be properly managed and controlled. Neither too small nor too large inventory should be maintained.

Former would result in stock out, resulting in lost sales and latter involves heavy investments. Thus, a balance has to be maintained. As Prof. W. J. Stanton states, "the goal of inventory control is to minimize both the investment and the fluctuation in inventories while at the same time filling customer orders properly and accurately."

Correct anticipation of the product demand is necessary for maintaining the correct level of inventory. Properly estimated demand helps the business firms in terms of cost of inventory, supplying to customers in time and maintaining the production schedule.

Material Handling: Material handling includes all those activities which are associated in moving products when it leaves the manufacturing plant but before it is loaded on the transport. This activity has been in existence for a very long period of time, and now it has developed as a system.

It involves moving the goods from plant to warehouses and from warehouses to place of loading in transport modes. Proper management of material handling helps in avoiding unnecessary movement of goods, avoiding damage to the goods, facilitate order processing and efficient movement of goods,

Material handling is the sub part of the total physical distribution system and helps in reduction in cost and better service to consumers. Effective management of the material handling system leads to the effectiveness of the total physical distribution system and thereby makes it economical.

### 4. Transportation

Transportation as a component of physical distribution is concerned with the movement of goods from the warehouse to customer destination. It includes loading and unloading

of goods and their movement from one place to another. In doing so it provides time and place utility. Transport accounts for a major portion of the distribution cost and of the total price of the product.

Being a major cost element, marketers must take keen interest in transportation decisions as it will help in reducing cost and increasing customer satisfaction. Correct form of transportation mode is very essential as it directly affects the price of the product. Proper choice facilitates smooth movement of goods on time and in good condition. The transportation mode therefore needs to be adequate, regular and dependable.

## INTEXT QUESTIONS 20.3

1. What are the components of physical distribution?

2. _____ is associated in moving products from warehouse to transport

   a) Material handling  b) inventory

   c) transport  d) Processing

## 20.4 MARKETING FORCES AFFECTING DISTRIBUTION

### 1. Factors Related to Products

Product is a prime factor in channel selection. Product-related factors are among most relevant and powerful factors affecting channel decision. Channel must fit the type and nature of the company's products. Such factors include:

**A. Perishability of Product:** Perishable products must be sold and consumed immediately after production. So, for perishable products, normally, direct or short channel is advisable. For durable products, an indirect or multilevel channel is preferable. However, due to availability of rapid means of transportation and advanced cold storage facilities, the perishable product can also be sold by long-indirect channels.

**B. Technical Aspects:** Technical products cannot be used without sufficient information and direct supervision. Even, they need more frequent services. It is advisable to adopt indirect and multilevel channels to assist consumers to use the technical product properly and safely. For simple products, direct channels can be used.

**C. New v/s Existing Product:** Consumers need more information and attention for new products. More efforts and time are required to convince consumers. As a result, a company may opt for an indirect channel to take help of middlemen in this task. For existing products, the company can use direct and/or indirect channels.



**D. Complexity and Risk Related to Use of Product:** Complex and risky products are sold via middlemen as consumers expect more direct supervision and assistance,

**E. Size of Product:** In case of heavy and bulky products, direct or short channel. s more suitable. This is due to difficulties related to physical movement of the product.

**F. Divisibility of Product:** Mostly, indivisible products are distributed directly to customers. Divisible products can be conveniently distributed by middlemen.

**G. Unit Price of Product:** Precious products, like gold, jewellery, certain chemicals, software, etc., are distributed using direct or short channels of distribution. Use of direct and short channels can minimize risk of theft or robbery.

**H. Legal Aspect:** Quite obviously, permitted (legal) products can be distributed by any convenient channel of distribution. But illegal products are distributed by direct channels for secrecy purposes.

### 2. Factors Related to Company

Company's internal situations have a direct impact on the choice of marketing channel. Manager has to analyze company-related factors to decide the best fit channel(s). Company-related factors include:

**A. Company's Financial Position:** Financially sound companies can maintain separate and well-equipped departments for distribution of products. Such companies can open and manage their own retail outlets and can hire salesmen to manage distribution effectively. They do not require services of middlemen and, hence, can distribute the product directly. But, financially weak companies have to opt for indirect channels to share resources and expertise of channel members.

**B. Product Mix of Company:** A company's product mix consists of product lines and product items in each product line. Many product lines and several product items/ varieties in each of the product lines can enable the firm to offer multiple choices to a large number of consumers. Even, the firm can take advantage of the scale of the economy. In such cases, direct channels are more advisable. Small companies with limited product lines and/or product items should distribute products via wholesalers and retailers, who sell products of many companies.

**C. Desire for Control:** If a company desires to have direct and close control over production and selling activities, direct channels are preferred and vice-versa.

**D. Experience and Expertise:** Successful distribution needs considerable experience and expertise. If a company possesses necessary experience, expertise, and staff, it can manage selling activities on its own. When a company lacks such experience and skills, it has to involve middlemen, and prefers indirect channels.

**E. Facilities and Staff:** Sufficient facilities and capable staff are essential for effective distribution of products. If a company manages needed facilities and staff, direct channels are used, otherwise indirect channels are used.

**F. Company's Past Experience:** A company's past experience can also affect channel decision. When a company has favorable and satisfactory experience to work with middlemen, it may continue working with them. In case, if it is not satisfied with terms and services of middlemen, it would shorten its channel of distribution.

### 3. Factors Related to Middlemen

Companies consider several middlemen-related factors while deciding on channels. Most common factors include:

**A. Creditworthiness of Middlemen:** Middlemen's credibility is an important criterion to decide on the channel. If middlemen have good reputation and creditworthiness, a company can multiply its gain and, as a result, prefers to involve them in their distribution activities. Creditworthiness is a critical aspect while offering dealerships or franchises for a definite area.

**B. Attitudes of Middlemen:** Positive attitudes of middlemen make companies to involve them in distribution activities. Companies like to select indirect channels with one or more levels. Opposite situation leads companies to select direct channels.

**C. Services Rendered by Middlemen:** Channel decisions depend on the number and quality of services offered by middlemen to customers. When the channel members are ready to provide several services to customers, like home delivery, free repairing, credit facility, installment payment schemes, and other post-sales services, the manufacturers like to involve them in distribution to avail such services to their customers. When middlemen do not provide the useful services to customers, companies prefer direct channels.

**D. Financial Capacity of Middlemen:** Strong financial capacity of middlemen attracts manufacturers. This is due to the fact that a strong financial position benefits both manufacturers and customers. Strong financial position results in speedy recovery of bills receivable, less chances of bad debts, immediate payment, credit facility to customers, and also advanced payment.

**E. Terms and Conditions:** When terms and conditions laid down by middlemen are not favorable, the manufacturers don't like to involve them in distribution activities. They prefer direct distribution channels.

## 4. Factors Related to Market

Market (consumer behavior) is a crucial factor in channel selection. Main factors related to market includes:

**A. Size of Market:** In case of a large and concentrated market, it is economically affordable for a company to manage its own distribution setup. When the market is small, it is advisable to assign distribution tasks to middlemen.

**B. Geographical Concentration:** When a firm's customers are highly concentrated (living in a nearby area) in a particular region, it can directly deal with customers by using any of the direct channels. But, when my customers are scattered in several regions; it is not convenient to use direct channels. Middlemen can do a better job with less costs.

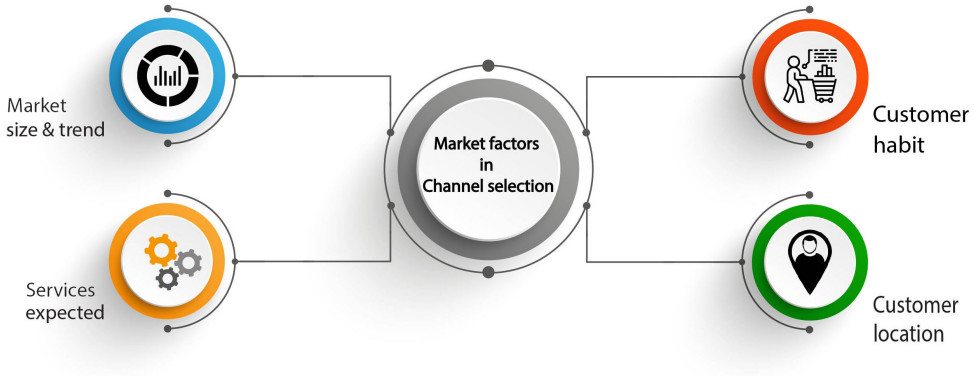



*Fig. 20.2:* **Market Factors in Channel Selection**

**C. Services Expected by Market:** Number and types of services expected by the target market, and company's capacity and readiness to meet them are important issues to be considered in this connection. For example, if the market expects a lot of services and the company is unable and/or unwilling to satisfy them, indirect channels are preferred to avail the services from middlemen.

**D. Habits of Consumers:** Distribution channels must be fit with habits of consumers. Manager should find out why. How, when, where and from whom the consumers like to buy. For example, if consumers are habituated to buy a little quantity frequently from nearby retailers on credit, a company must involve retailers (along with wholesalers) to avail products at all the places where consumers reside.

**E. Current Market Trend:** Firm's distribution system must be compatible with the recent market trend. Trend includes a number of variables like policies and practices of giant national and multinational companies, functioning of departmental stores and corporate retailers, cyber marketing and network marketing, business partnering with banking, insurance, and other service providers, customers' awareness, and so on.



### 5. Factors Related to Competition

Current and anticipated competition affects the company's decision on marketing channels. Relevant competition-related aspects must be analyzed while selecting the channel. Competition-related factors include:

A. **Intensity of Competition:** When there exists a severe competition in the market, a company must consider competitor's distribution strategies and practices while selecting marketing channels. In case of less competition, a company choice will be independent of competition.

B. **Response and Reactions of Competitors:** Reactions and response of the close competitors must be taken into account while deciding on the distribution channel. A company must select such channels that can help avail competitive advantages.

C. **Company's Competitive Position in Market:** A leading company can design its own distribution network. It can select a specific channel of distribution as per its requirements. But the follower companies have to follow the market leader. Their choice depends on the leader's practice.

### 6. Factors Related to Environment

Marketers have to consider the overall business environment while deciding on a marketing channel. Domestic and global environmental forces have direct or indirect impact on company's activities and operations. Main environmental forces that affect channel decision include:

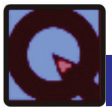
A. **Economic Condition of Country:** Country's economic condition affects a firm's operations. In economically poor countries, short or direct channels are used to sell products at low prices. In developing and developed countries, normally, indirect channels are used to distribute products.

B. **Phases of Trade Cycle:** Phases of trade cycle, like recession, recovery, prosperity, etc., indicate the country's economic condition. Normally, in the prosperity stage, long and indirect channels are used due to the need for mass distribution and willingness of people to pay high prices for the product. Direct and short channels are more suitable when the economy is passing through a recession phase as direct and short channels keep the selling price low.

C. **Legal Provision:** Government policies and legal provisions have direct or indirect implication on a firm's distribution activities. Managers must identify relevant provisions affecting distribution activities and, accordingly, an appropriate channel(s) should be selected. Taxes, charges, administrative procedures, restrictions, and other issues are worth noting in this regard.



**D. Availability of Facilities:** Availability, costs, and quality necessary facilities play a decisive role in channel selection. Facilities like transportation, communication, warehousing, banking, insurance, supporting government agencies at national and international level, degree of harmony among states of the country, and relations among nations at large affect firm's channel decisions.



## INTEXT QUESTIONS 20.4

1. What major categories of forces affect distribution?
2. Differentiate cycle and lead time?
3. _____ is not a phase of trade cycle

   a. Recession  b. Prosperity  c. Recovery  d. Responsiveness

## WHAT YOU HAVE LEARNT

**Physical distribution:** Physical distribution is the group of activities associated with the supply of finished product from the production line to the consumers. It creates 'time' and 'place' utility, which maximizes the value of products "by delivering them to the right customer at the right time and right place".

**Role of distribution:** Delivery of satisfaction, standard of living, value addition, communication, employment, efficiency and finance are the major roles of distribution.

**Components of physical distribution:** Order processing, storage and warehousing, inventory control, material handling and transportation

**Marketing forces affecting distribution:** Factors related to products, company, markets, middlemen, environment and competition are considered for selection of physical distribution.

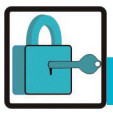
## KEY TERMS

| | | |
|---|---|---|
| Distribution | Product | Company |
| Market | Mode of transportation | Storage |
| Order Processing | Material Handling | Packing |
| Competition | Trade cycle | Recession |

## TERMINAL EXERCISE

1. Define distribution
2. Give an objective of distribution
3. What are the major types of distribution?
4. What is recession period
5. What is order processing
6. How to control inventory?
7. What is the importance of distribution to customers?
8. Explain trade cycle
9. Give the company factors affecting distribution
10. How middlemen affect the distribution
11. Brief about the need and objectives of physical distribution
12. Explain the role and importance of distribution
13. Describe the components of distribution
14. How to manage distribution considering cost and time factors
15. Explain the marketing forces affecting distribution





## ANSWERS TO INTEXT QUESTIONS

### 20.1

1. Distribution means to spread the product throughout the marketplace such that a large number of people can buy it.

2. Physical distribution is the set of activities concerned with efficient movement of finished goods from the end of the production operation to the consumer. Important physical distribution functions include customer service, order processing, inventory control transportation and logistics, and packaging of materials.

3. Choice a.

### 20.2

1. Need of PD

   a. Creating Time and Place Utility

   b. Helps in Reducing Distribution Cost

   c. Helps in Stabilization of Price

   d. Improved Consumer Services

2. Role of PD

   Delivery of satisfaction, Standard of living, Value addition, Communication, Employment, Efficiency and Financing

3. Choice a.

### 20.3

1. Components of physical distribution includes order processing, storage and warehousing, inventory control and transportation

2. Choice a.

### 20.4

1. Under marketing forces affecting distribution, factors related to products, company, markets, middlemen, environment and competition are considered for selection of physical distribution.

2. Cycle time indicates the level of responsiveness of production. Lead time, however, is the time it takes for an order to be fulfilled after production; it includes preparation, packing, and delivery. Lead time indicates the level of responsiveness of distribution. Taken together, cycle and lead time indicate how well your company produces and delivers its embedded systems.

3. Choice d.

## DO AND LEARN

Take the examples of FMCG goods and perishable commodities that have to be distributed from the warehouse to the retailers for use by consumers. Make two groups of your class and find out how the physical distribution to be carried out efficiently for the two types of goods selected considering the external forces affecting distribution.

## ROLE PLAY

Ram and Krishnan are friends and both do business. Ram deals with processed food products and Krishnan is the producer of handicraft products. One day they met each other in a restaurant and discussed the issues in their product physical distribution to reach the consumers using different channels. Now, continue their discussion on the above subject.

Ram: Krishna can you tell me how you plan your inventory so that consumers always get your product

Krishna: .....

21

# CHANNELS OF DISTRIBUTION

A distribution channel, in simple terms, is the flow that a good or service follows from production or manufacturing to the final consumer/buyer. Distribution channels vary but typically include a producer, a wholesaler, a retailer, and the end buyer/consumer. The target for any business is to bring their product or service to the market and make it available for consumers by creating a distribution path or channel. The link between producers and the end consumer is normally intermediaries, such as wholesalers, retailers, or brokers. Distribution channels affect the prices of goods and their positioning in their respective markets. A distribution channel must be efficient and effective. It means that transportation and other logistical requirements need to be used at maximum capacity and at the lowest rates possible.

## LEARNING OUTCOMES

After studying this lesson the learner:

- defines channels of distribution in warehouse;
- explains the functions of distribution channels in warehouse;
- lists the types of distribution channels in warehouse;
- defines the types of middlemen in a warehouse;
- identifies the right distribution channel in warehouse;
- recalls designing distribution channels in warehouse.

## 21.1 DEFINE CHANNELS OF DISTRIBUTION

The term distribution collectively refers to all the acts or services rendered by various agencies. It consists of an operation or series of operations which physically brings the

goods from the producer into the hands of the final user. The Word Channel is derived from the French Word "Cannal". The channel of distribution refers to the pathway taken by the goods as they flow from the point of production to the point of consumption.

Channel of distribution refers to those people, institutions or merchants who help in the distribution of goods and services.

According to the American Marketing Association," A channel of distribution or marketing channel is the structure of intra – company organization units and extra company agents and dealers, wholesalers and retailers through which a commodity, product or service is marketed."

Philips Kotler defines channel of distribution as "a set of independent organizations involved in the process of making a product or service available for use or consumption".

### 21.1.1 Importance

A channel of distribution for a product is the route taken by the title to goods as they move from the producer to the ultimate consumer or industrial user. The channel of distribution is very important to the producer and the consumer. There is a big gap between the producer and the consumer and the gap is shrinking by the channel of distribution. The middlemen in the channel of distribution collects the outputs of various products, subdivides the products according to the needs of the consumers and gathers this in the assortment wanted and disperses this assortment to consumers or industrial buyers. The middlemen are specialists in concentration, equalization and dispersions. They create time, place, form and possession utilities.

Channels of distribution provide convenience to customers, who can get various items at one store. If there were no channels of distribution, customers would have faced a lot of difficulties. A distribution channel is a chain of business intermediaries through which a good or service passes until it reaches the final buyer or the end consumer.

### 21.1.2 Understanding Distribution Channels

A distribution channel is the path by which all goods and services must travel to arrive at the intended consumer. Conversely, it also describes the pathway payments made from the end consumer to the original vendor. Distribution channels can be short or long, and depend on the amount of intermediaries required to deliver a product or service.

Goods and services sometimes make their way to consumers through multiple channels, a combination of short and long. Increasing the number of ways a consumer is able to find a good can increase sales. Longer distribution channels can also mean less profit each intermediary charges a manufacturer for its service.



Channels are broken into two different forms-direct and indirect. A direct channel allows the consumer to make purchases from the manufacturer while an indirect channel allows the consumer to buy the goods from a wholesaler or retailer. Indirect channels are typical for goods that are sold in traditional brick-and-mortar stores. Conversely, a direct or short channel may mean lower costs for consumers because they are buying directly from the manufacturer.

## INTEXT QUESTIONS 21.1

1. Define channels of distribution?
2. What do you understand about distribution channels?
3. _____ is provided by channels of distribution to customer

   a). Convenience

   b). Money

   c). Satisfaction

   d). Sales

## 21.2 FUNCTIONS OF DISTRIBUTION CHANNELS

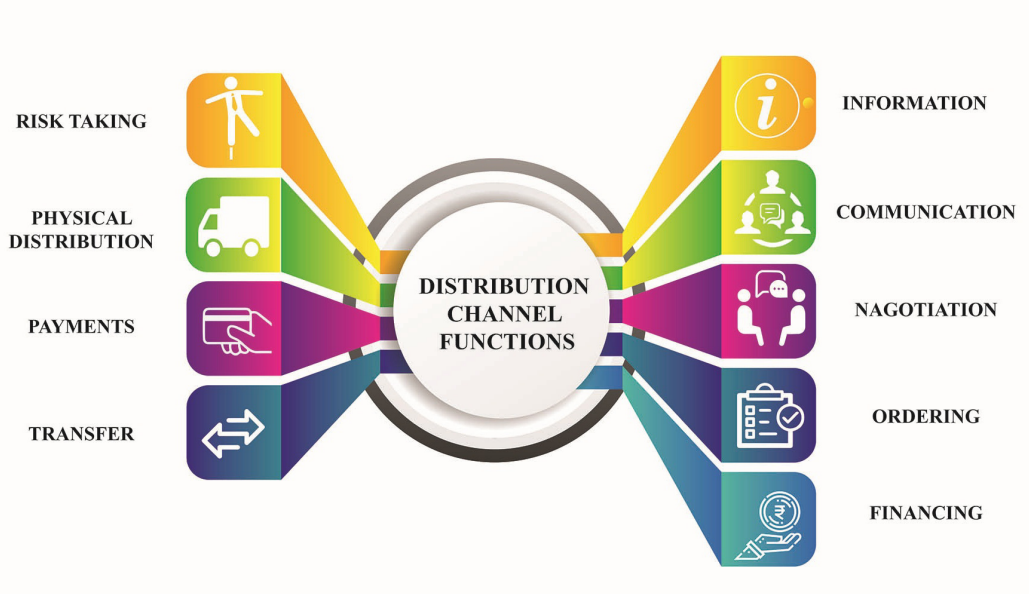



*Fig. 21.1:* **Distribution Channel Functions**



Distribution channels perform a number of functions that make possible the flow of goods from the producer to the customer. These functions must be handled by someone in the channel. Though the type of organization that performs the different functions can vary from channel to channel, the functions themselves cannot be eliminated. Channels provide time, place, and ownership utility. They make products available when, where, and in the sizes and quantities that customers want.

### 21.2.1 Breaking bulk

Distribution channels provide a number of logistics or physical distribution functions that increase the efficiency of the flow of goods from producer to customer. Distribution channels create efficiencies by reducing the number of transactions necessary for goods to flow from many different manufacturers to large numbers of customers. This occurs in two ways. The first is called breaking bulk. Wholesalers and retailers purchase large quantities of goods from manufacturers but sell only one or a few at a time to many different customers. Second, channel intermediaries reduce the number of transactions by creating assortments providing a variety of products in one location so that customers can conveniently buy many different items from one seller at one time. Channels are efficient.

### 21.2.2 Transportation and storage

The transportation and storage of goods is another type of physical distribution function. Retailers and other channel members move the goods from the production site to other locations where they are held until they are wanted by customers. Channel intermediaries also perform a number of facilitating functions, functions that make the purchase process easier for customers and manufacturers. Intermediaries often provide customer services such as offering credit to buyers and accepting customer returns. Customer services are oftentimes more important in B2B markets in which customers purchase larger quantities of higher-priced products.Wholesalers buy products to make them available for retailers and sell products to other channel members. Retailers handle transactions with final consumers.

### 21.2.3. Information

Channel members can provide two-way communication for manufacturers. They may supply the sales force, advertising, and other marketing communications necessary to inform consumers and persuade them to buy. And the channel members can be invaluable sources of information on consumer complaints, changing tastes, and new competitors in the market.



## INTEXT QUESTIONS 21.2

1. Give the major distribution functions
2. _____ channel member transacts with final customer

   a. Retailer

   b. Wholesaler

   c. Distributor

   d. Commission agent

## 21.3 TYPE OF DISTRIBUTION CHANNELS

Broadly, Channel of distribution structure is as follows:

(1) Direct Channel

(2) Indirect Channel.

### 1. Direct Channel or Zero Level Channels

When the producer or the manufacturer directly sells the goods to the customers without involving any middlemen, it is known as direct channel or zero level channels. It is the simplest and the shortest mode of distribution. Selling through post, internet or door to door selling etc. are the examples of this channel.

**Producer** ⇒ **Consumer**

The direct distribution channel does not make use of any intermediaries. The manufacturer or producer sells directly to the end consumer. The direct form of distribution is typically used by producers or manufacturers of niche and expensive goods and items that are perishable. The main drawback of this direct channel:

- It is uneconomical to have direct contact with the customers, who are countless and scattered all over.
- It is not possible for a direct contact with the multi millions of potential customers for the products.

## 2. Indirect Channels

When a manufacturer or a producer employs one or more middlemen to distribute goods, it is known as indirect channel. The indirect distribution channel makes use of intermediaries in order to bring a product to market. The Following are the main forms of indirect channels:

### A. Manufacturer-Retailer-Consumer (One Level Channel):

The one-level channel entails a product coming from a producer to a retailer and then to the end buyer. The retailers buy the product from the manufacturer and sell it to the end buyers. The one-level channel is ideal for manufacturers of furniture, clothing items, toys, etc.

**Producer ⇒ Wholesaler/Retailer ⇒ Consumer**

In the channel there is an intermediary wholesaler / retailer. A manufacturer sells goods to consumers through these intermediaries. There is a gap between the manufacturers and the consumer. This method is adopted when the buyers are large, for perishable goods that need speed in distribution. In this channel the manufacturers use the functions of a wholesaler or retailer. Generally, automobile appliances, clothings, and shoes are sold directly to retailers.

### B. Manufacturer-Wholesaler-Retailer-Customer (Two level channels):

The two-level channel follows the following process:

**Producer ⇒ Wholesaler ⇒ Retailer ⇒ Consumer**

Wholesalers generally make bulk purchases, buy from the producer, and divide the goods into smaller packages to sell to retailers. The retailers then sell the goods to the end buyers. The two-level channel is suitable for more affordable and long-lasting goods with a larger target market.

### C. Manufacturer-Agent-Wholesaler-Retailer-Consumer (Three level channels):

**Manufacturer ⇒ Agent ⇒ Wholesaler ⇒ Retailer ⇒ Consumer**

The three-level channel is similar to the two-level channel, except the goods flow from the producer to an agent and then to a wholesaler. Agents assist with selling the goods



and getting the goods delivered to the market promptly. The agents normally receive a commission and are allocated the task of product distribution in a particular area. The three-level channel is suitable for goods that are in high demand and with a target market that stretches across a country.


This level comprises three middlemen i.e. agent, wholesaler and the retailer. The manufacturers supply the goods to their agents who in turn supply them to wholesalers and retailers. This level is usually used when a manufacturer deals in limited products andyet wants to cover a wide market.

### D. Modern Distribution Channel

The Internet is the Modern-Day Distribution Channel. With e-commerce growing tremendously over the past couple of decades, manufacturers and producers are now able to use online marketplaces to sell their goods. The internet is also ideal for service providers.

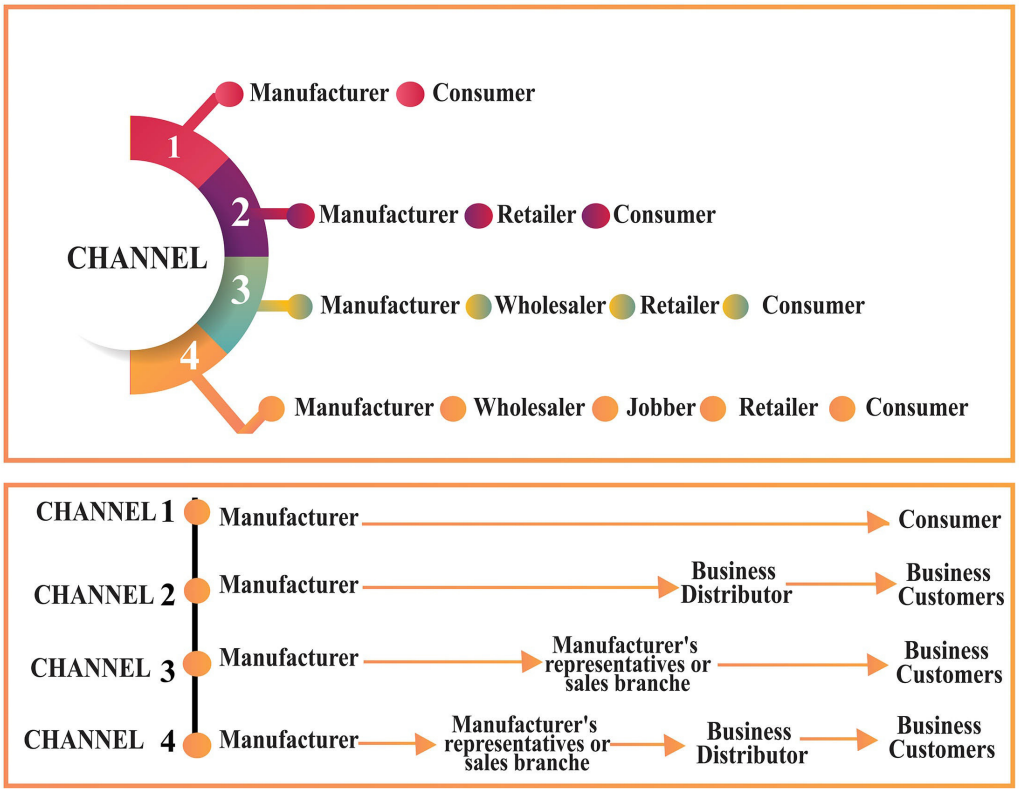



*Fig. 21.2:* **Type of Distribution Channels**

## INTEXT QUESTIONS 21.3

1. How many types of distribution channels are available?
2. Which channel is known as three level channels?
3. Direct channel is also called as _____ channel

   a. Zero level  b. One level

   c. Two level  d. Three level

## 21.4 TYPES OF MIDDLEMEN

Middlemen refer to, such institutions or business concerns situated in the marketing channels at points between the producer and the final buyers.

### A. Definition

According to the American Marketing Association, "A middleman is one who specializes in performing operations or rendering services that are directly involved in the purchase and sale of goods in the process of their flow from the producer to the final consumer."

### B. Importance of Middlemen

Middlemen are very important in the modern ever widening market, by making the distribution easy and smooth. Organized markets for many commodities are created by them. They create time, place and possession utility. Middlemen concentrate their effort on marketing and distribution of goods.

### 21.4.1 Functions of Middlemen

Middlemen's functions are known as marketing functions. The marketing functions are the functions of exchange, functions of physical supply and facilitating functions. The functions of middlemen are:

- The middlemen are the connecting link between the sellers and buyers. They help the sellers and buyers to enter into a contract of sale or purchase.
- They direct the flow of goods from the producer to the ultimate consumer.
- Merchant middlemen perform the function of merchandising by making the goods fit for the market segmentation.
- Middlemen are responsible for the flow of goods.



- Large scale production is possible with the help of middlemen. They collect huge orders and large purchases of products lead to large scale production.

### 21.4.2 Agent Middlemen

They are mostly engaged in wholesale dealing. They assist in negotiating sales or purchase or both on behalf of the seller or buyer. They do not take the title of the goods which they handle. The different kinds of agent middlemen are:

1. **Broker:** A broker is an agent. He represents the buyer or the seller in negotiating purchases or sales without having physical control over the goods involved. His main service is to bring the buyer and the seller together. He is the agent of the owner of goods, seeking a buyer other than the agent of a buyer who is seeking for supply.

2. **Commission Agent:** Commission agent is an agent – individual, firms or even companies. It negotiates the sales of goods belonging to the principal. It customarily exercises physical control over the sale of goods. It has the power on price, and terms of sale under the condition that it must obey the instructions of the principals.

3. **Manufacturer's Agent:** Manufacturer's agents are employed by the manufacturers to sell their products. The agent receives a percentage of commission based on his sales. He uses his techniques. He employs his sales representatives, who work for him. Selling is his main function. These types of middlemen are important in the marketing of industrial goods.

4. **Selling Agents:** Selling agents are independent middlemen. He operates on a contractual basis. He negotiates all sales of a specified line of merchandise or the entire output of its principal. He has authority over the price, terms and other conditions of sale. He is the sole selling agent for the line.

5. **Resident buyers:** Resident buyer is an independent agent, and he specializes in buying for retailers. He receives compensation or a fee on commission basis. He operates in lines of trade, such as furniture, garments etc. He has his office in the marketplace. The resident buyers are purely and simply an independent agent specialized in buying for principals who are retailers.

6. **Auctioneers:** They are generally appointed by business firms. The auctioneer receives the goods and invites bids for the goods. The highest bidder gets the goods and the auctioneer collects the amount from him.

### 21.4.2 Merchant Middlemen

Merchant middlemen buy and sell goods on their own account and risk. They take the title of goods. They resell the goods at profit. They are wholesalers and retailers.

### A. Functions of Merchant Middlemen

- They are the connecting link between the producers and consumers and goods are supplied where they are in demand.
- They match the demand with production.
- They perform the important functions of advertisement, display etc.
- They know the purchasing powers of customers and by informing the producers, fix reasonable prices.
- They offer too many communications between producers and customers.

## 21.4.3 Wholesaler

A wholesaler is a businessman who specializes in performing wholesale activities. The word wholesaler means to market goods in relatively large quantities.

### A. Definition

According to the American Marketing Association," Wholesalers buy and resell merchandise to retailers and other merchants and to industrial institutions, and commercial users, but do not sell in significant amounts to ultimate consumers."

### B. Functions of the Wholesalers

- **Buying and Assembling:** The wholesalers procure varieties of goods from various producers regularly and preserve them in his shop for resale.
- **Warehousing:** The wholesaler stores goods in large quantities in his own or hired warehouses. This ensures uninterrupted supply of goods to the retailers.
- **Transporting:** Transportation involves the bringing of goods from the plant door to his godown and also from his godown to the retailer's shop.
- **Financing:** He offers financial assistance to the retailers through extension of credit facilities. On the other hand, he buys from the manufacturers for cash or for a relatively shorter period of credit.
- **Risk bearing:** Since he acquires the title over the goods in which he deals, he assumes the risk arising out of changes in demand, spoilage and deterioration in quality of the goods kept in his godown.



### 21.4.4 Retailers

The word retailer is derived from a French word retailen which means "to cut again."

**A. Definition -** According to Cundiff and Still, "a retailer is a merchant or occasionally an agent whose main business is selling directly to the ultimate consumer."

**B. Importance -** It is one of the important functions of the marketing process. The retailer is an intermediary in the marketing channel of distribution. He is both a marketer and consumer. He is a specialist in selling goods to the ultimate consumer. Retailers create place, time and possession utilities. He supplies the needed goods from the place of production to the place where it is demanded. He sells the goods at a reasonable price at the time when the customers want the goods.

**C. Services of the Retailer**

- The primary job of a retailer is to assemble different varieties of goods from various wholesalers.
- A retailer helps in the physical flow of the goods from the producer to the consumer. The retailer satisfies the daily wants of the people by creating place utility
- He provides the availability of many varieties of goods from many manufacturers. He provides varieties of choice enabling the consumers to select the commodities easily.
- A retailer attracts consumer's attention to new goods and their arrival by personal salesmanship. He brings new products and new varieties to the knowledge of consumers.
- The retailer gives advice and guidance to the consumers regarding the purchase of goods. It is essential for him to establish a permanent and continuous relationship with consumers.

### 21.4.5 Advantages and Disadvantages of Middlemen

It is generally felt that a good amount of the final price is eaten away by the middlemen.

**A. Advantages / Services rendered by middlemen**

- There are many functions like assembling, warehousing, transporting etc are performed by the middlemen. They also take active part in the distribution of finished goods.
- The important functions of distribution and its risk burden are assumed by middlemen, and the producers have been freed.
- Because of the services of the middlemen, goods are brought to the places where they are needed.

- Specialization, which is the result of division of labour, is important in modern marketing, when there are specialized dealers.
- We can eliminate the middlemen, but we cannot eliminate their functions. It means someone has to perform the functions. The marketing functions cannot be eliminated.

### B. Disadvantages of Middlemen

- The appearance of middlemen in marketing functions costs about 35% to 50% of the price paid by the consumer.
- There are large numbers of middlemen between the consumers and producers. Some of these middlemen do not perform any function but these people create hindrance in the free flow of goods towards the market.
- All types of risks arising out of depression and recession, strikes, scarcity are not shouldered by the middlemen.
- They enter into black marketing in times of scarcity and emergencies with a view to earn huge profits, by boosting the price.
- Communications have been developed extensively, and different modes of transporting systems are available regularly. Hence, middlemen can be eliminated.

## INTEXT QUESTIONS 21.4

1. List the types of agent middlemen
2. Give the disadvantages of middlemen
3. Middlemen can be eliminated in _____ channel

   a. Direct  b. Indirect

   c. Two level  d. Three level

## 21.5 CHOOSING THE RIGHT DISTRIBUTION CHANNEL

Not all distribution channels work for all products, so it's important for companies to choose the right one. The channel should align with the firm's overall mission and strategic vision including sales goals.

The method of distribution should add value to the consumer. Do consumers want to speak to a salesperson? Will they want to handle the product before they make a purchase? Or do they want to purchase online with no hassles? Answering these questions can help



companies determine which channel they choose. Secondly, the company should consider how quickly it wants its product(s) to reach the buyer. Certain products are best served by a direct distribution channel such as meat or produce, while others may benefit from an indirect channel. The main factors which help in determining the choice of distribution channels include product, company, market and environment.

### 21.5.1 Product Related Factors

Following are the important product related considerations in deciding on channels of distribution:

A. **Product type:** In case of industrial goods like CT scan machines, short channels like zero level channel or first level channel should be preferred because they are usually technical, expensive, made to order and purchased by few buyers. Consumer goods like LCD, refrigerator can be distributed through long channels as they are less expensive, not technical and frequently purchased. The technical nature of the product requires services. Hence, sales and servicemen are needed to explain the use of the product to the customers. For products like computers, business machines etc., direct channels are more advantageous.

B. **Perishable and Non- Perishable Products:** Perishable products like fruits or vegetables are distributed through short channels while nonperishable products like soaps, oils, sugar, salt etc. require longer channels.

C. **Value of Product:** In case of products having low unit value such as groceries, long channels are preferred while those with high unit value such as diamond jewellery short channels are used. When the unit value of a product is high, a direct channel is effective. On the other hand, when the unit value is low, the direct channel is ineffective. If the product is of low value, larger and cheaper channels will be better. Short and costly channels may be used if the products are of high value.

D. **Product Complexity:** Short channels are preferred for technically complex goods like industrial or engineering products like machinery, generators like torches while non complex or simple ones can be distributed through long channels.

### 21.5.2 Company Characteristics

Following are the main Company Characteristics offering choice of channel of distribution:

A. **Financial Strength:** The companies having huge funds at their disposal go for direct distribution. Those without such funds go for indirect channels i.e., they depend on the intermediaries.

B. **Control:** Short channels are used, management wants greater control on the channel members otherwise a company can go in for longer channels. When a firm wants to exercise control over the price, the way in which customers are served etc., direct channel is suggested.

C. **Reputation:** It has been said that reputation travels faster than man. There are many companies, which have good reputation because of the product preference by the customers. Many intermediaries are eager to have connections with such companies.

### 21.5.3 Competitive Factors

A company has to decide whether to adopt the same channel as that of its competitor or choose another one. The middlemen are able to offer a good facility of storage. The channel which facilitates maximum sales must be preferred. The cost of each attractive channel may be estimated on the basis of unit sale. The best type of channel which gives a low unit cost of marketing may be considered. The characteristics of buyers as to their number, location, frequency of the purchase, quantities bought by them etc influence the channel selection. The channel adopted must facilitate the commodities produced to be available to the consumers in time

### 21.5.4 Market Factors

Following are the important market factors affecting choice of channel of distribution:

A. **Size of Market:** If the number of customers is small like in case of industrial goods, short channels are preferred, while if the number of customers are high as in case of convenience goods, long channels are suited. Long channels will have to be employed if the product is meant for the consumer market and industrial market. There is a need for a number of middlemen services if the number of potential customers is large. If the number of potential customers is small, direct selling is suggested.

B. **Geographical Concentration:** Generally, long channels are used if the consumers are widely spread while if they are concentrated in a small place, short channels can be used.Direct selling is effective if the customers are concentrated in a few places. If they are situated over the whole country, then a large number of middlemen will have to be employed.

C. **Quantity Purchased:** Long channels are used in case the size of order is small while in case of large orders, direct channels may be used. If the sales volume is large, direct selling is suitable. Industrial distributors sell industrial operating supplies.

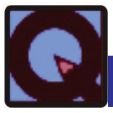


### D. Customer buying habit:

This affects the channel policies very much. When the buyer's habit and purchase pattern of consumers are frequent and small in size, then indirect selling is suitable.

### 21.5.5. Environmental Factor

Economic factors such as economic conditions and legal regulations also play a vital role in selecting channels of distribution. For example, in a depressed economy, generally shorter channels are selected for distribution.



## INTEXT QUESTIONS 21.5

1. How to choose the right channel?
2. What are the major factors affecting the choice of channel?
3. Technical and expensive products should use _____ channel

   a. Short  b. Long

   c. Indirect  d. None

## 21.6 DESIGNING DISTRIBUTION CHANNEL

Designing an appropriate industrial distribution channel and managing it is a tough and continuing task. A well designed channel structure helps to achieve the desired marketing objectives. A channel structure consists of types and number of middlemen, terms and conditions of channel members, number of channels. The various steps that are involved in industrial distribution channel design in industrial markets are given in the figure.

### 21.6.1. Steps Involved in Industrial Channel Design Process

Let us understand each of the stages of industrial distribution channel design process in detail:

### A. Analyzing the Needs of the Customer

When a marketer designs a marketing channel, he must understand the service output levels desired by the target customers. Different customers have different levels of service requirements. A high potential customer needs to be offered effective and professional service backup, ensuring availability of varied products compared to the low potential customer. The marketing channel designer has to know at this stage itself that providing superior service output means increased channel costs and higher prices for customers.

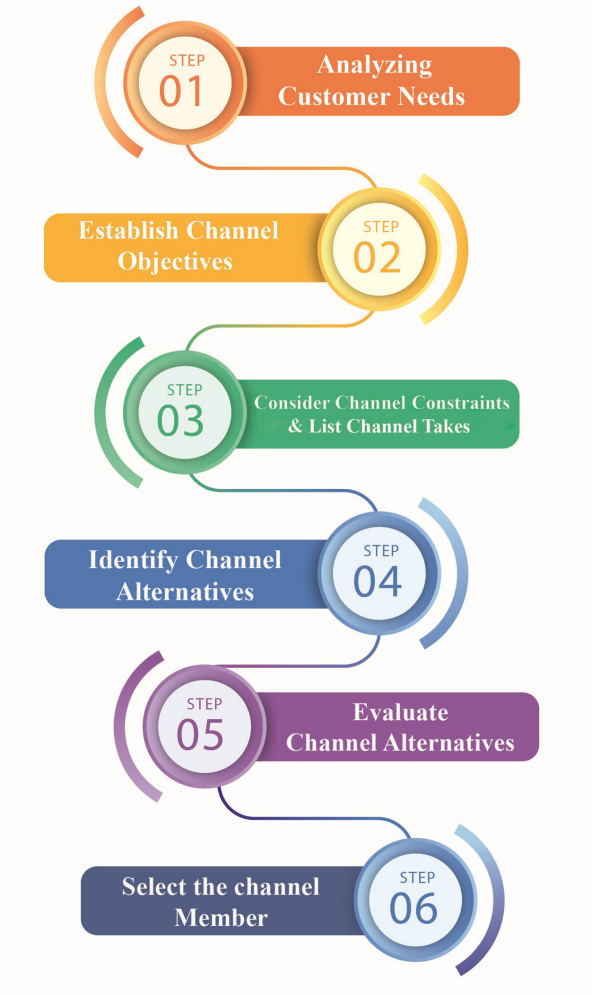



*Fig. 21.3:* **Designing distribution channel**

## B. Establishing Channel Objectives

Channel objectives are a part of and result from the company's marketing objectives that need to be stated in terms of targeted service output levels. Profit considerations and asset utilisation must be reflected in channel objectives and the resultant design. It should be the endeavour of the channel members to minimise the total channel costs and still provide the desired level of service outputs. Channel objectives keep varying depending on the characteristics of the products.

## C. Considering Channel Constraints

The industrial marketer develops his channel objectives keeping into consideration various constraints like the company, competition, the environment, product characteristics and the level of service output desired by the target customers.



- Company: If a company has financial limitations as a constraint, then it may restrict its direct distribution approach through company sales force to few high potential customers.
- Competition: If a competitor has been very successful through direct service then it may force all other firms also to adopt the same strategy of direct selling.
- Environment: Economic conditions, legal regulations are the environmental factors that affect channel design. During recession, producers use economical ways to sell the products to avoid additional costs. Similarly, the law looks down upon those channel arrangements that try to build a monopoly market or minimize competition.
- Product characteristics: As already mentioned, complex and non-standard products require direct distribution without any intermediaries.
- Customer: The industrial marketers depend on intermediaries to offer services to customers who are either giving less business or are located at far-off places and prefer to serve the nearby or high potential customers by themselves.

## D. Listing Channel Tasks

The industrial marketers have to creatively structure the necessary tasks or functions to meet customer requirements and company goals. They have to first make a list of various tasks to be performed, identify the critical tasks and make objective and realistic decisions on which tasks can be effectively performed by the company and which cannot be performed due to certain constraints.

## E. Identifying Channel Alternatives

There are four issues that are involved in identifying the channel alternatives. They are:

a. **The types of business intermediaries:** There are different types of intermediaries that the industrial marketers should identify. They have to consider various factors like the tasks to be performed, product and market conditions before selecting either manufacturer's representatives or agents, industrial distributors, brokers, commission merchants or value-added resellers.

b. **Number of intermediaries:** The manufacturers have to settle on the number of intermediaries they wish to use in their channel structure. They may either go for intensive, selective or exclusive distribution.

c. **Number of channels:** Industrial marketers need to serve various market segments. This necessitates them to use more than one channel for distributing and marketing their products. This multi-channel approach helps them not only to increase their

market share but also reduce their costs. However, the industrial marketers need to take care of possible channel conflicts like proper demarcation of territory to channel members to sell and serve the customers in their respective areas.

d. **Terms and responsibilities of Channel Members:** There are various terms and conditions which the industrial marketer must make clear to the participating channel members like the responsibilities and tasks, conditions of sale and territorial rights that would enable both of them to enhance their performance.

- **Responsibilities and tasks:** In order to avoid any future disagreements, there should be clarity in the roles of both the industrial marketers and the channel partners. Each should comply with the commitments about their individual responsibilities and tasks to be performed.
- **Conditions of sale:** It should be clearly mentioned well in advance about the discounts offered by the manufacturers to the distributors, the commission to be paid to the agents or brokers. Other terms relating to warranty period, replacement of defective parts also should be appropriately stated.
- **Territorial rights:** The territory between the distributors should be well demarcated so as to avoid any future confusion that may lead to legal issues.

## F. Evaluating Alternate Channels

There are several channel alternatives available to the industrial markets. They have to determine the best among the alternatives by evaluating them based on the following criteria:

a. **Economic Performance:** Different channel alternatives generate different levels of sales and incur different levels of costs. An industrial marketer has to pose a question whether sales generation would be more by direct selling through company sales force or through the channel members. The marketing manager has to similarly estimate the total costs of selling through different channel members.

b. **Degree of control:** An industrial marketer exercises different levels of control over different channel members. The degree of control is more on company sales force and least on distributors.

c. **Degree of adaptability of channel members:** With the market changing dynamically the channel members should have the capacity to adapt themselves to the changing environment. The industrial marketer must be able to control as well as modify the channel structure. Each channel member should be committed to the agreement they have with other members.

## INTEXT QUESTIONS 21.6

1. What are the stages involved in designing the distribution channel?
2. _____ important factor while evaluating the channel alternatives

   a. Degree of control
   b. Economic performance
   c. Adaptability
   d. All these

## WHAT YOU HAVE LEARNT

**Distribution:** Delivering the right product, at the right time, in the right condition, into the right set of hands.

**Physical distribution:** Involves a series of activities from order processing, inventory control, transportation and logistics, packaging of materials and customer service.

**Direct channel:** Manufacturer sells directly to the consumer


**Agent middlemen:** Do not take title of the goods which they handle; assist in negotiating sales or purchase or both on behalf of the seller or buyer.

**Indirect channels:** Involve multiple intermediaries before the product ends up in the hands of the consumer

**Distribution channels:** Path by which all goods and services must travel to arrive at the intended consumer and ensure flow of goods from the producer to the customer. Includes wholesalers, retailers, distributors and the Internet

## KEY TERMS

| | | |
|---|---|---|
| Distribution Channel, | Agent Middlemen, | Merchant Middlemen, |
| Choice of channel | Designing channel, | Direct channel, |
| Indirect channel, | Functions, | Breaking Bulk |

## TERMINAL EXERCISE

1. Define channels of distribution
2. List the major functions of channels of distribution
3. What major types of distribution channels are used
4. Give the role of merchant middlemen
5. Give the advantages of wholesalers
6. Brief about the direct channel merits in the current scenario
7. Explain the two and three level channels with examples
8. List the product factors affecting the selection of distribution channel
9. Give the steps involved in designing the distribution channel
10. What major factors are considered for the identifying of channel alternatives
11. Brief about the importance and functions of distribution channels
12. Describe the various types of middlemen involved in the distribution channel
13. Discuss on the merits and demerits of each channel members in distribution
14. Design distribution channels for any four different kinds of products of your choice

## ANSWERS TO INTEXT QUESTIONS

### 21.1

1. A channel of distribution or marketing channel is the structure of intra – company organization units and extra company agents and dealers, wholesalers and retailers through which a commodity, product or service is marketed
2. A distribution channel is the path by which all goods and services must travel to arrive at the intended consumer. Conversely, it also describes the pathway payments made from the end consumer to the original vendor. Distribution channels can be



short or long, and depend on the amount of intermediaries required to deliver a product or service.

3. (a)

## 21.2

1. Distribution channels provide a number of logistics or physical distribution functions that increase the efficiency of the flow of goods from producer to customer. The transportation and storage of goods is another type of physical distribution function. Some wholesalers and retailers assist the manufacturer by providing repair and maintenance service for products they handle. Channel members also perform a risk-taking function. Last, channel members perform a variety of communication and transaction functions
2. (a)

## 21.3

1. Direct and indirect are the two types of channels available for distribution.
2. Manufacturer – Agent – Wholesaler – Retailer – Consumer
3. (a)

## 21.4

1. Types of agents' middlemen

   Broker, Commission Agent, Manufacturer's Agent, Selling Agents, Resident buyers and Auctioneers
2. All types of risks arising out of depression and recession, strikes, scarcity are not shouldered by the middlemen. They enter into black marketing in times of scarcity and emergencies with a view to earn huge profits, by boosting the price. Hence, middlemen can be eliminated.
3. (a)

## 21.5

1. Not all distribution channels work for all products, so it's important for companies to choose the right one. The channel should align with the firm's overall mission and strategic vision including sales goals.
2. The main factors which help in determining the choice of distribution channels include product, company, market and environment.
3. (a)

## 21.6

1. Stages in designing channel
   - Analysing the Needs of the Customer
   - Establishing Channel Objectives
   - Considering Channel Constraints
   - Listing Channel Tasks
   - Identifying Channel Alternatives
   - Evaluating Alternate Channels
2. (d)

## DO AND LEARN

The choice of channel for different products differs and considering the other factors like objectives, company, competitors, market, environment that affect the channel selection, divide the class into four groups and each group could assume a product category like durable, perishable, technical and cost and do the exercise of channel selection.

## ROLE PLAY

Shiva and Tharun are the marketers of textiles and processed foods; and both are discussing the channel designing for their products with minimum involvement of middlemen so that their profit is not compromised and consumers also benefited. Both converse as below and any two groups can discuss points to follow their conversation and end up in a suitable channel design.

Shiva: Hi, Tharun, how are you

Tharun: Fine Shiva, doing well and hope better for you also. I thought of talking to you regarding the marketing channels to be designed for my products. Could you please give me points?

Shiva: Fine, I am glad to do so…….

22

# WEREHOUSE ACTIVITIES

There are a series of important activities which take place to ensure effective operations flow within the warehouse. In general, warehouse activity consists of receiving, putting away, storage, packing, and shipping. Receiving is an operation that involves the assignment of trucks to dock and the scheduling and execution of unloading Activities. This activity includes material handling activities verifying the location of the product material and the placement of the product. Shipping is an activity that involves scheduling and assignment of trucks to docks the orders, packing after picking and loading of trucks. After goods are received and before goods are shipped, a series of internal warehouse activities take place to ensure an effective flow through the warehouse and to organise and maintain company inventories. In large warehouses, these different handling tasks can be separated by departments, and the integration managed by a directed workflow.

A modern warehouse provides various ways of adding value to the product. The Warehouse Management System controls two sets of operations:

- On the Operations front the system manages, controls and directs all operations including receiving processes, put away processes, order processing, inventory allocation, picking process, packing process and finally shipment along with inventory updating.
- On the inventory front, the system maintains inventory in the warehouse at Zone & individual location level, SKU level, pallet wise, carton wise and unit level inventories for multiple customers and allows specific inventory attributes and parameters to be built in to manage, allocate or block the inventory.

## LEARNING OUTCOMES

After studying this lesson the learner:

- explains the various activities of warehouse;

- identifies the details of receiving in warehouse;
- classifies the picking types in warehouse;
- lists the details of packaging in warehouse;
- finds the reading labels in warehouse;
- summarizes the terms like shipping or dispatch..

## 22.1 ACTIVITIES IN A WAREHOUSE


***Fig. 22.1:*** **Warehouse activities**

The main activities of a warehouse are as under:

- Receiving the goods
- Loading and Unloading
- Picking goods
- Packing the goods
- Dispatching the shipment
- Returns Management
- The value addition at the warehouse
- The quality check at the warehouse

### 22.1.1 Receiving

It is an act of handling products into a warehouse and putting it into the right storage location. Products should be received via an Advance Shipping Notice (ASN) from a supplier whether the product is single or an object or liquid or in carton packing or crates or in pallet packing. With the help of ASN the consignment can be easily tracked in the

system. Some customers require it as an inventory to be delivered at one point, whereas some may require the consignment to be delivered at a specific location before the inventory is even updated. Hence the system is set up entirely based on customer needs. Here techniques to be adopted suitably which helps in optimising the receiving of goods, so that the delivery can be made smoothly and the customers are never disappointed without the product.

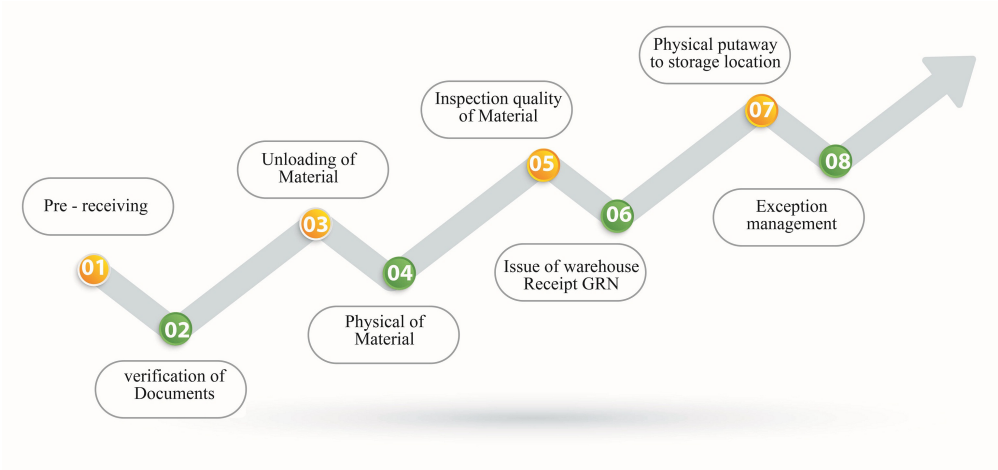



*Fig. 22.2:* **Receiving goods**

**Sorting:** Sorting of the goods can be performed both upon receipt of goods and when the goods are sent out. Goods are sorted according to the customer needs, place of delivery and accordingly sent for transportation to the end user.

### 22.1.2 Loading and Unloading

Loading is the process of outing the material into a truck, container or a train. Loading has to be done in a fashion that there is no damage during the transit. In case of multi point delivery, the load which needs to be unloaded first needs to be loaded last. The loading supervisor has to take care of both stowing and lashing. Any empty space in the vehicle has to be plugged to ensure zero damage during transit. The time taken to take the vehicle is also critical. During month end when the dispatches get bunched it is critical to keep the loading time to minimum without compromising on quality.

Unloading is the process of taking out the cargo from the truck. It is required when the cargo reaches the warehouse. Mishandling of the goods while unloading can lead to damage of goods, hence it is one of the most critical tasks of warehousing operations. Unloading can be done manually or with the help of forklifts depending on the nature of cargo. Any mishandling may lead to damage to the cargo and subsequently heavy loss. Hence unloading must be always done through trained personnel only and must be continuously monitored.



### 22.1.3 Picking

Picking is an important process in the warehouse. The purpose of existence of the warehouse is to fulfil the customer orders. Picking is the process of retrieving the material as per the order received.

There are various methods of Picking. The warehouse can apply discreet picking when the number of orders is not large. Batch picking allows the goods to be picked in batches and then segregated as per individual orders. In case of zone wise picking, the warehouse is divided into various zones and each zone assigned to individual pickers. Each order travels through various zones, and each picker fulfils his part of the order. In case of Wave picking, the orders are released in waves at standard schedules. One of the most important parts in picking is the picking accuracy. The warehouse needs to continuously monitor the picking accuracy and creates the system of makers-checkers to ensure zero errors.

### 22.1.4 Packing

There are many ways in which goods can be packed within the distribution centres. Instead of digging deep into the packing process, let's follow some important rules of successful packing:

- Consignments must be packed taking care of their size, numbers, temperature, toxicity, cost, fragility, cleanliness and other statutory requirements.
- Checking Picking Accuracy and Quality checks should be a part of the packing process.
- If the goods are picked from different zones within the warehouse, then they must be easily combined to ensure completeness of the order.

### 22.1.5 Dispatching

A proper flow of operations ensures timely dispatch of goods as and when it is required to be loaded into the trucks. Hence the dispatch manager therefore must maintain equilibrium and plan out packing and dispatching schedules according to vehicle pickup times. It should not be that goods are ready too early creating a clutter in the storage area, nor should they be too late delaying the whole process of loading and dispatching, which in turn will give late deliveries. An important part of the dispatching process is correct documentation. The dispatch supervisor must ensure that all the correct documents are travelling along with the shipment.



### 22.1.6 Returns

This is one thing which none of the companies will ever want to happen. But returns are an intricate part of all businesses, and the number of returns is increasing day by day for most of the organisations, especially due to the e-commerce revolution. Major concern is when the return is only for one of the items only.

Following rules must be taken care of to minimise the complexities in return of items:

- When the goods are returned customers should be given Return Management Authorization which says what is returned and why it has been returned.
- All returns must be in synchronisation with the item details, tallying the product code and its invoice number in the system.
- Organisations should have a well-designed process beforehand which should dictate what is to be done with the returned item, as to whether it has to be taken back into stock, or repaired or destroyed or recycled or sent back to the manufacturer etc.
- All details must be entered into the system once goods are returned clearly mentioning as to why goods are returned back.
- Stock should be updated when the returned goods are taken back into the stock. Returns are a crucial part of any business. A systematic process must be in place which records the whole transaction and credit process accurately.

### 22.1.7 Value-Adding

In this section products are kitted, assembled, relabeled, modified, graded or subject to some other value adding process. The value adding part is about performing work on the product to make it 'ready for sale. This can be a complex process especially when too many items are clubbed to form a new item. Certain products require certain value addition to be done at the warehouse. Agricultural commodities may require grading of the goods. Kiting is a common service at the warehouse, for running promotional schemes. Warehouses may be required to do labelling. The prospective buyers can inspect the goods kept in a warehouse.

### 22.1.8 Quality Check

Quality check is a process of testing the units and ascertaining if they are within the guidelines for the final product. The main reason for the testing is to ascertain if any corrective measures are to be adopted in the manufacturing of the item. Good quality check always ensures to meet consumer demands and deliver better quality products.

## INTEXT QUESTIONS 22.1

1. What is receiving activity in a warehouse
2. In what ways value addition is carried out in warehouse
3. _____ is increasing day by day due to e-commerce also

   a. returns  b. shipping

   c. picking  d. checking

## 22.2 DETAILS OF RECEIVING

### 1. Compile the Correct Metrics

In absence of correct metrics, the warehouse receiving process will be completely shut down, and it will be difficult to set up an effective system. Metrics to gather include:

- Total time taken to shift materials from the system to end user
- Faulty reports
- Utilisation of Dock
- Issues in shipping from supplier

### 2. Pre-Receiving

Before the beginning of the receiving process, you will need to establish and enforce receiving requirements for suppliers and shippers. The target should be to make available the cargo as quickly and efficiently as possible. Prerequisites for packaging include:

- Positioning of Labels
- Information on Labels
- Whether cargo is loose or palletized
- Quantity of packages per pallet
- Number of items in each carton
- Package size and weight should be as per the norms dictated



### 3. Labour and Booking

For a successful warehouse receiving process, a proper amount of man hours must be allocated. The number of shipments coming to the warehouse should tally with the workload. Labour cost is the highest warehouse operational cost, hence evaluate this cost properly and accordingly schedule the labour shifts.

### 4. Shipment Identification

An inventory clerk should be always present as soon as a delivery truck arrives at the unloading dock and receives the shipment properly. Any discrepancy in order should be immediately reported to the concerned authorities before he signs the delivery receipt and accepts the shipment. For this the inventory clerk should undergo proper training and he has to have a good command over the handling process.

### 5. Product Count

After the inventory clerk signs the shipping notice, warehouse staff should start the unloading process and count the product received to ensure that the correct number of the shipment has been sent to the warehouse. Every pallet should be opened and counted and proper invoice slips should be there in each pallet so that a proper synchronisation is there between products received and purchase department.

### 6. Damage Replaced

The inventory clerk should check if any product is damaged during the transit, if any damaged product is found it should be kept safely aside and inform the delivery driver for picking it again and arrange for necessary replacements. Each item should be checked thoroughly so that the correct number of replaced items can be reported.

### 7. Receiving Documentation

All products should be given unique inventory numbers before stocking them into the shelves. Inventory clerks should input the product information into the data system of the warehouse which should be in synchronisation with all the other departments which require the similar information. All the written documentation should be filed properly by the inventory clerk for auditing purposes.

### 8. Label Correctly

Labelling methods are changing constantly. It is not the same as it was 10 years ago. It is different today than it was 10 years ago, and it is constantly changing. Due to the use of computers now there is bar-coding, ID scanning, pallet management, and more. Because of these improvements it has become necessary to ensure that labelling is accurate. If the

label looks different from the earlier one it should be properly checked. The labelling personnel should be properly trained and he should be at pace with the current labelling system.

### 9. Error-Ready Replenishment Process

A replenishment process ensures the re-order of items in the warehouse in 2-, 4-, or 6-week intervals. In order to have an efficient and productive warehouse receiving process a replenishment process should leave room for error. If the replenishment process is error free customers will not suffer due to defective items received or if miscounts are made.

### 10. Be Thorough with the Inspection

A successful receiving process is the one which has a proper inspection process for handling incoming and outgoing goods. This process helps to address issues of all the vendors, shippers and other handlers and accordingly can be escalated even. Formats used in receiving of goods are as under Categorizing / grouping items with similar properties. The Receiving Supervisor is responsible for receiving all the inbound material, put-away till GRN.

## INTEXT QUESTIONS 22.2

1. What is pre receiving
2. Why product count is done
3. _____ is a correct metrics gathered in the receiving process
   a. Numbers of container
   b. Faulty reports
   c. Number of Dock
   d. Issues from customer

## 22.3 PICKING TYPES

Picking is an extremely important warehousing process. This stage drives the productivity of the whole dispatch and ordering process and makes it one of the most critical processes in supply chain management. The first decision in the picking is the decision to decide the methodology of processing the orders. There are two broad ways to achieve this:

1. **Discrete Order Picking -** In this method one order is picked at a time. This method is common when travel is not a major factor and when customer orders average one to a few products. For example, the warehouse received orders as under: The picker will first go and pick for order 1. After completing order 1 he will complete order 2 and henceforth one by one for each order. The picker moves to collect the products necessary for one order. This is a simple method of order picking which requires sending a picker around the warehouse with an order list and a box or container. The picker pulls each item, following the most efficient route. This method is used when the line items and quantity per order is less.


*Fig. 22.3:* **Picking Types**

2. **Batch Picking -** In this method multiple orders are picked in one go. Fox example warehouse receives 3 orders as under: In Batch picking, the picker instead of picking each order individually, picks in bulk. He will pick7 units each for SKUI and 2 and 15 units of SKU3. After doing the bulk picking, he will then divide into individual orders. Following factors need to be considered in determining whether to go for batch picking or individual order picking methodology.

a. Percentage of orders that contain full cases. In case the percentage of orders consisting, full orders exceeds 50% the batch picking method is recommended. In case it is less than 25% the individual order method is recommended. For a share between 25 to 50% a hybrid or either system can be used based on other criteria.

b. Line-item characteristics of the orders. If sixty percent and more orders have line items of 5 and less it is recommended to go for an individual order system.

There are three more methods of picking as under:

4. **Wave Picking -** Wave picking is a process that combines discrete and batch picking together. Sets of similar orders are picked and fulfilled in scheduled time frames or in waves. Real-time orders are downloaded as they are received. Orders accumulated for specific picking times and transport routes are called 'waves'. The warehouse manager decides how the wave of the orders to be released depends upon the load factor. Waves generally have orders with similar SKUs or in close proximity or could have similar shipping deadlines. Wave picking is commonly used in the E-commerce industry for fulfilling customer orders.

5. **Zone Picking -** Zone picking consists of different employees assigned to different zones within a warehouse and only picking items located in their specific zone. This order picking has each worker in charge of a section and pulls from her section to fill incoming orders. The box may move through several sections until the order is complete, often along a conveyor belt.

   For example: If an order comes through that requires items from Zone A and Zone B. the picker in Zone A. will gather his items and pass on the order to the picker in zone B to complete the order. This is ideal for large businesses with a high rate of inventory turnover. With increasing online orders, companies are increasingly installing picking apparatus such as put walls, put-to-light systems, goods-to-person systems and cross-belt sortation systems, to cope with the larger volume of small orders.

6. **Cluster picking-** is a piece picking process that lets you pick items for multiple orders at the same time by clustering them into pick clusters

Following are some of the other factors to be considered in determining the right picking system

a. The pick location assigned to each product should be based on the 80/20 rule. This means that fast-moving products should be in picking locations that hold more stock.

b. You should be able to move a product into or out of its picking location easily as the level of its activity moves up or down over time. The physical setup of the picking system should minimise the travel time of the pickers whenever possible. The same is true with the method of picking used.

c. The picking method should minimise the number of times the products must be handled before they are placed into the final cartons used for shipping.



### 7. Pick List

Pick list is a document containing the list of materials to be picked for shipping orders. A pick list usually has a number of line items to be picked up by a picker, sometimes it may have a single line item and may vary up to the order requirement.

### A. Different Forms of Pick List

a. **Computer Generated Pick List:** This is the most common type of a pick list generated using a computer and printed using a printer and a copy is handed over to a picker to perform a picking activity.

b. **Automated Pick List:** The information regarding picking and the details of items to be picked will be communicated to a picker through a 'Handheld device'. The screen in the device will display the details of the pick list. The device and the computer will be connected through Wi-Fi connectivity (wireless). Below mentioned sample figure depicts an automated pick list using a hand-held device. Handheld scanners can really help when it comes to picking-taking away a lot of the human error which comes into play when performing repetitive tasks.

## INTEXT QUESTIONS 22.3

1. How many types of picking you have learnt
2. What are the different forms of picking list
3. _____ is used in automated pick list
   a. Handheld device
   b. pickers
   c. computer
   d. none of these

## 22.4 DETAILS OF PACKAGING

Packaging is the science, art and expertise of enclosing or defending goods for distribution, storage, sale, and use. Packaging also refers to the procedure of designing, evaluating, and producing packages. Packaging can be portrayed as a coordinated system of organising commodities for transport, warehousing, logistics, sale, and end use. Packaging contains, protects, preserves, transports, informs, and sells.



If packages are poorly packed, the possibility of damage increases greatly. The shipping carton should be of such strength that it cannot be bent or crushed easily, and it should be packed so that the products will not shift during transit. The equipment needed in the packing area includes tape machines, box knives, shrink wrap ma- chine, strapping machine and various stamps. If you do not use a conveyor system, you will need a packing table. Returns from the customer should be closely monitored to find the returns related to poor packing and the process should be improved accordingly.

### 22.4.1 Importance of Proper Packaging

A. **Physical guard -**The substances enclosed in the package may need defence from, among other things such as mechanical shock, vibration, electrostatic discharge, compression, temperature, etc.

B. **Barricade protection -** A barrier to oxygen, water vapour, dust, etc., is often essential.

Permeation is a critical factor in design. Some packages hold desiccants or oxygen absorbers to assist extend shelf life, where Customised atmospheres or controlled atmospheres are also sustained in some food packages. Keeping the contents hygienic, fresh, sterile and safe for the duration of the intended shelf life is a chief function. A barrier is also executed in cases where separation of two materials prior to end use is necessary as in the case of special paints, glues, medical fluids, etc. At the consumer end, the packaging barrier is broken or measured amounts of material are removed for mixing and subsequent end use.

C. **Containment -** Small objects are typically grouped together in one package for reasons of storage and selling efficiency. For instance, a single box of 1000 pencils needs fewer physical handling than 1000 sole pencils. Liquids, powders, and granular materials need containment.

D. **Information diffusion -** Packing communicates how to use, transport, recycle, or dispose of the package or product. With pharmaceuticals, food, medical, and chemical products, some kinds of information are necessary by government legislation. Some packages and their labels also are used for track and trace purposes. Most objects include their serial and lot figures on the packaging, and in the case of food products, medicine, and some chemicals the packaging often contains an expiry/best-before date, usually in a shorthand form. Packages may specify their production material with a symbol.

E. **Marketing -** Packaging and labels can be used by marketers to persuade prospective buyers to acquire a product. Package graphic blueprint and physical design have been imperative and frequently evolving phenomena for numerous decades, Marketing

communications and graphic design are functional to the surface of the package and often to the spot of sale display. Most packaging is planned to replicate the brand's message and uniqueness.

Security packing can play a significant position in tumbling the safety hazards of shipment. Convenience Packages can have attributes that insert convenience in distribution, handling, stacking, display, sale, opening, reclosing, using, dispensing, reusing, recycling and simplicity of disposal

F. **Positioning -** Packing is increasingly used to go beyond marketing to brand positioning with the materials used and design chosen key to the storytelling element of brand development.

### 22.4.2 Packaging options

A. **Air shrinks packaging -** When you apply heat, shrink wrap shrinks tightly over the product.

B. **Skin packaging -** A heated film is draped over a product and onto an underlying layer and a vacuum then draws the film down onto the package, securing it.

C. **Stretch wrapping -** A highly stretchable plastic film wrapped around items. The elastic keeps the items together.

D. **Blister packaging -** Several types of pre-formed plastic packaging used for small consumer goods such as lip balm, foods, and pharmaceuticals.

E. **Overwrapping-**Functional over an article or over another structure of packaging made from plastic or paper.

F. **Clamshell packaging -** A clamshell is a one-piece container consisting of two halves connected by a hinge area which allows the formation to come together to store products such as fruit.

For all kinds of packaging, there are diverse types of packages. The different kinds of packages can be categorised into two groups:

G. **Retail containers:** These containers guard food or the content from diverse damages and at the same time they promote the product for retail sale. For instance, glass bottles, sachets, over-wrapped plastic bottles, metal cans, etc. They can be used for home storage also.

H. **Shipping containers:** These containers hold and protect food and other objects during Distribution and transport or any other marketing task. For example, sacks

stretch, or shrink wrapped containers corrugated fibreboard cartons, drums, barrels, crates, and foil bags.

### 22.4.3 Packaging Material

The various types of packaging material generally used are as under:

- Paper & Board
- Glass
- Metals
- Plastics
- Wood
- Bamboo
- Cork

1. **Paper & Board -** Paper is extensively used because it costs little, holds its shape, and is simply decorated. Commercially available paper is mostly made from cellulose fibre from pulped wood, but can also be prepared from other sources such as cotton, straw, sisal and hemp. All are recyclable. Packaging formed using paper and board comprises cartons, labels, leaflets, tubes, corrugated cases, rigid boxes and pulp packs.

2. **Glass -** Commercially-available glass is prepared from silica, sodium carbonate and calcium carbonate. Other composites can be supplementary to give colour, sparkle or heat shock confrontation. Glass is an admired and constructive packaging material because it is:

- Inert
- Sterilisable
- Barrier to moisture and gas
- Pressure resistant to a degree
- Can be moulded into a variety of shapes
- Transparent making the product visible
- Glass is also highly recyclable

The clearest drawback is fragility and the hazard of broken glass. The precision of glass can be a difficulty where the product is degraded by light. Glass can be directly decorated but is most commonly labelled.

3. **Metals -** The metals used in packaging are predominantly tin-plate or aluminium and are used to make food and drink cans, aerosol cans, tubes, drums and slip or hinged lid Drums. Aluminium is used for drinks cans, closures, trays, tubs and tubes. As foil it can be used in multi- laminate structures or as a blister pack or container seal.

   Metal can be oppressed to fabricate the following packaging uniqueness:

   - Strong and rigid
   - Barrier to gas and moisture
   - Pressure resistant
   - Temperature and pressure resistant / tolerant.
   - Corrosion resistance via coatings
   - Sterilizable
   - Directly decorated or labelled

The boundaries of metal packaging are in weight and shapes attainable, particularly when compared to plastics. Aluminium packaging for finished products

4. **Plastics -** This is the most widespread packaging material and, at the same time, one of the most complicated to dispose of. The factors universal to all plastics are that they are light, strong and economical to manufacture. It is for these reasons that they are used so much, as a substitute to cardboard glass packaging materials. Plastics can be used as single materials or in amalgamation. Their properties vary considerably but usually include:

   - Lightweight
   - Easily moldable into almost limitless shapes
   - Can produce rigid containers or flexible films.
   - Can be impact resistant
   - Directly decorated or labelled
   - Heat sealable

The comparative demerits of plastics are naturally polymer specific and the accurate choice of polymer can to a realistic degree mitigate the weakness.

5. **Wood -** Typically used for pallets and crates (heavy duty goods). Some lidded or hinged boxes are produced. e.g., cigars, gifts, tea, cheese. High price spirits use wood and little caps incorporate wood.

6. **Bamboo -** Bamboo is emerging as a packaging material. Bamboo packaging assists to diminish environmental impacts and encourage a healthier planet. This reduces packaging-related carbon footprint. Bamboo is the fastest mounting woody plant in the earth. Bamboo packaging is eco friendly and can be composted after use.

7. **Cork -** Cork has a long background as a packaging material. Companies that are looking to be more eco-friendly or vegan are turning to cork as an alternative use for packaging. Cork comes from the dead cells that gather on the outer surface of cork oak trees. It's also extremely resilient as it can be pressed to 40% of its volume and still return to its original size when released. Another great aspect is that it's fire-resistant; flames only char the surface and don't generate toxic fumes. One of the bonuses of using cork is that it is entirely natural, recyclable and biodegradable. In fact, it's actually recognized as one of the most ecologically friendly materials available.

### 22.4.4 Packaging Machines

There are numerous kinds of packaging machines existing such as strapping machines. Wrapping machines, filling machines, sealing machines, coding machines and labelling machines. The packing machines are available in different varieties and are as follows:

- Bottle packing
- Conveyors packing Machines
- Cleaning packing
- Cup filling and sealing
- Drying Machinery
- Food processing packing
- Labelling packing
- Handling packing
- Packing tube machine
- Container Machinery
- Coding and Marking
- Cartooning packing
- Closing packing
- Filling packing
- Form fill seal packing
- Multifunction machine
- Inspection packing
- Pouch filling machine.

- Pharmaceutical processing packing machine
- Pure pack packing machines
- Strapping Machines
- Wrapping machines
- Palletizing and depalletizing packing machine
- Sterilisation machines.
- Vacuum packing machines

## INTEXT QUESTIONS 22.4

1. What is security packaging
2. What is blister packing
3. List any two packing machines
4. _____ decrease the risks of pilferage and easy for resale of products
   a. Packaging
   b. Picking
   c. Receiving
   d. sorting

## 22.5 READING LABELS

**A. Meaning:** Labelling or Packaging label is any written, electronic, or graphic communication on the package or on a separate but associated label.

**B. Definition:** Labelling is a part of branding and enables product identification. It is printed information that is bonded to the product for recognition and provides detailed information about the product. Customers make the decision easily at the point of purchase seeing the labelling of the product.

Reading label may be classified into following

**a. BRAND LABEL -** is a brand alone applied to a product or to the package

**b. GRADE LABEL-** identifies the quality of a product by a letter, numbers or words.

c. **DESCRIPTIVE LABEL-** placing on the label details such as component parts of the products, chemical analysis, weight, size, use of artificial colour, the percentage, age, use of product, directions etc.

d. **INFORMATIVE LABEL-** it contains fuller instruction on the use and care of the product. It may contain recipes, instructions for clearing and other information of similar nature.

### 22.5.1 Functions of Labelling

The different functions of labelling are as follows:

- **Defines the product and its contents:** A label is informative about the product's usage and caution to be taken while using the product.
- **Recognition of product:** Labelling assists in the identification of the product. Example, the brand name of a biscuit will help one choose from the rest of the confectionery items available.
- **Assorting of products:** It means classification or grading of products according to different categories in the market. Example, soaps are categorised as dry hair, normal hair and oily hair types and cater to consumers in the market with the dry, normal and oily scalp, respectively.
- **Assists promotion of products:** It gives the customer the reason to purchase the product. Example, it attracts the attention of the consumer by displaying messages such as *10% free' or 'save rupees 10' message in its packets.
- **In compliance with the law:** Labels should strictly abide by the law, Example, as the statutory warning on its package; Cigarettes should have 'Smoking is injurious to health.

### 22.5.2 Warehouse Labels

Labelling the warehouse is a key factor of warehouse plan that is frequently overlooked by warehouses and allocation centres. Why do you need warehouse labels? Warehouse inventory tags and barcode labels provide the foundation for an efficient warehouse operation.

A. **Efficient navigation:** Attached with warehouse signage resolutions, warehouse position labels such as long-range retro-reflective barcode labels and warehouse bottom labels make it simple for employees to navigate the facility, cutting down on travel time and traffic congestion in aisles.

**B. Streamlined processes:** Warehouse rack labels streamline picking and stocking processes by taking the guesswork (and potential human error) out of identifying the proper storage locations for needed inventory.

**C. Improved tracking accuracy:** Transportable storage containers like totes, trays, and pallets can be complex to track, but strong warehouse label solutions propose simple identification of every moveable container, making it simple to identify the right inventory without wasting time with physical data searches.

**D. Get the right products to the right place:** Workers can scan freight to locations in real time and quickly and accurately identify the precise location of freight when in staging aisles.

## INTEXT QUESTIONS 22.5

1. What are grade labels?
2. What are warehouse labels?
3. _____ assists in the identification of the product

   a. Labelling  b. Storing

   c. Handling  d. warehousing

## 22.6 SHIPPING OR DISPATCH

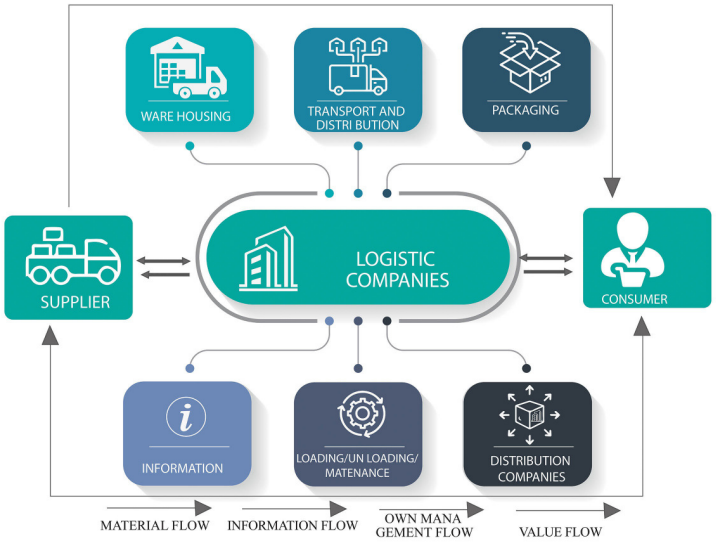



*Fig. 22.4:* **Dispatching Process**

Shipping is the last stage of dispatch, where the cargo is prepared for the requested mode of transit. The tasks performed usually include weighing each carton, labelling the carton, recording shipment information in a manifest system, and applying address labels generated by the manifest system. This stage also includes the generation of the transit documents. If the shipment is travelling by Sea, it will require a Bill of Lading and Airway Bill in case of Air. If the shipment is moving with the country by Road, it will require a Lorry Receipt (LR). In case of a courier, a courier docket is prepared.

The packages may be sorted based on different modes of transport, or based on different carriers or based on different destinations. The carriers are invited and they pick up the shipment assigned to them. The carrier person also counts the packages assigned to him and tallied with the delivery note or the invoice.

The successful art of dispatch lies in the operation's ability to have goods ready for departure, just in time for carriers to load their trucks. The DC manager must therefore balance and forecast packing and dispatching according to carrier pick-up times. Goods that are ready too early, for example, will clutter staging areas, while dispatches that are late, will delay loading and potentially cause late deliveries.

### 22.6.1 Warehouse dispatch document checklist

- Dispatch invoice/Delivery challan/Dispatch Note
- Dispatch waybills
- Tally sheets (loading)
- Warehouse inspection reports
- Lorry Receipts from the Transporters/Bill of Lading for Sea / Airway Bill for Air

### 22.6.2 Delivery/Dispatch Note

The Delivery note or Dispatch note is a document that goes with the cargo after they are loaded into the truck. It is a mandatory document in business operations in many countries. This document is prepared by the supplier dispatch department before sending the cargo to the customer. It contains important details about the order placed and other important order details. The delivery note contains the details of quantity placed and not the value of the goods, because many times the supplier does not want to take the risk of disclosing his product prices to the forwarder or any other party involved in movement of goods. Packing list can be an additional document. The following fields appear in a delivery note.



Compulsory fields:

- Invoicing and Delivery address or sold to and Ship to fields
- Delivery note number and the date it was issued
- Product Code and Description
- Product quantity and measurement unit
- Total Gross and Net weight
- Remarks or Comments.
- Delivery terms

## INTEXT QUESTIONS 22.6

1. List any two dispatch documents
2. What is a dispatch note?
3. _____ is required if shipment is moving through sea

   a. Bill of lading

   b. Bill of airway

   c. Courier docket

   d. Lorry receipt

## WHAT YOU HAVE LEARNT

**Receiving**

Receiving is the act of handling products into a warehouse and putting it into the right storage location. Products should be received via an Advance Shipping Notice (ASN) from a supplier whether the product is single or an object or liquid or in carton packing or crates or in pallet packing. With the help of ASN the consignment can be easily tracked in the system.

| | |
|---|---|
| **Sorting** | Sorting of the goods can be performed both upon receipt of goods and when the goods are sent out. Goods are sorted according to the customer needs, place of delivery and accordingly sent for transportation to the end user. |
| **Loading** | Loading is the process of outing the material into a truck, container or a train. Loading has to be done in a fashion that there is no damage during the transit. |
| **Unloading** | Unloading is the process of taking out the cargo from the truck. It is required when the cargo reaches the warehouse |
| **Picking** | Picking is the process of retrieving the material as per the order received. The goods once picked need to be packed before delivering to the final customer |
| **Shipping / Dispatch** | Shipping is the last stage of dispatch, where the cargo is prepared for the requested mode of transit. The tasks performed usually include weighing each carton, labelling the carton, recording shipment information in a manifest system, and applying address labels generated by the manifest system. |

## KEY WORDS

| | | |
|---|---|---|
| Receiving | Advance Shipping Notice | Sorting |
| Loading | Unloading | Picking |
| Packing | Labelling | Dispatch |
| Consumer | | |

## TERMINAL EXERCISE

1. List the warehouse activities
2. What is a return

3. Give any two benefits of quality check
4. What is picking accuracy
5. What is sorting
6. What is labour and booking
7. What is a pick list?
8. Brief about loading and unloading
9. What is knitting
10. What is the need for a quality check?
11. What is dispatch
12. Give the packaging options
13. Explain any two-packaging material
14. What is informative label
15. Explain Quality check procedure in warehouse
16. What is Receiving, Sorting and Loading
17. What rules minimise the complexity in return
18. Explain the importance of packaging
19. What is the function of labelling and why warehouse labelling is needed?
20. What are the compulsory and optional fields that appear in the delivery note?
21. Explain the shipping process

## ANSWERS TO INTEXT QUESTIONS

**22.1**

1. It is an act of handling products into a warehouse and putting it into the right storage location.

2. Products are kitted, assembled, relabeled, modified, graded or subject to some other value adding process. The value adding part is about performing work on the product to make it 'ready for sale.

3. Option a.

## 22.2

1. Before the beginning of the receiving process, it is necessary to establish and enforce receiving requirements for suppliers and shippers. The target should be to make available the cargo as quickly and efficiently as possible.

2. After the inventory clerk signs the shipping notice, warehouse staff should start the unloading process and count the product received to ensure that the correct number of the shipment has been sent to the warehouse.

3. Option b.

## 22.3

1. Types of picking

    2. Discrete Order Picking

    3. Batch Picking

    4. Wave Picking

    5. Zone Picking

2. Forms of pick list

    1. Computer Generated Pick List

    2. Automated Pick List

3. Option a.

## 22.4

1. Security packing can play a significant position in tumbling the safety hazards of shipment. Packages can be engineered to assist decrease the risks of package pilferage or and resale of products

2. Blister packaging - Several types of pre-formed plastic packaging used for small consumer goods such as lip balm, foods, and pharmaceuticals

3. Any two packing machines

    a. Container Machinery

    b. Conveyors packing Machines

4. Option a.

## 22.5

1. GRADE LABEL-identifies the quality of a product by a letter, numbers or words.

2. Warehouse inventory tags and barcode labels provide the foundation for an efficient warehouse operation

3. Option a.

## 22.6

1. Dispatch documents

    Dispatch waybills

    Tally sheets

2. The Delivery note or Dispatch note is a document that goes with the cargo after they are loaded into the truck. It is a mandatory document in business operations in many countries. This document is prepared by the supplier dispatch department before sending the cargo to the customer

3. Option a.

## DO AND LEARN

The warehouse activities that are carried out for a company that manufactures processed milk products could be discussed and the students could take the responsibility of each activity in groups and document the procedure they should follow for the processed milk products and discuss with the teachers.

## ROLE PLAY

The warehouse activities involved differ for various companies and product types. Chandran is a manager in a mobile trading company that requires warehouse facilities. The company supplies mobile phones to the showrooms / retail shops of Tamil Nadu. Subbain is a small-scale producer of millet cookies and he utilises warehouse facilities for trading his produce to branded retail outlets all over the state. Both met together and started discussing how efficiently they could satisfy the consumers with least cost involved.

Two students could assume their roles and discuss the procedure they want to follow that results in customer satisfaction and cost reduction.

Chandran: ….

Subbain: …….

23

# CROSS DOCKING METHOD

Cross docking is defined as an operational tactic that moves objects through consolidation centres or cross docks without putting them into storage space. As the necessity to move inventory quickly increases, more logistics managers are turning to cross docking but the capability to implement such strategy well depends on superior planning, dynamic scheduling and coordination.

It is one of the techniques through which warehouses in India and across the globe can speed-up their distributing process by transporting inventory from a manufacturing plant directly to customers, and in this whole operation, the warehouse not only reduces the material handling, but also reduces the need to store the products in the warehouse.

## LEARNING OUTCOMES

After studying this lesson the learner:

- assesses the use of cross docking in business;
- identifies types of cross docking;
- lists the advantages and disadvantages of cross docking;
- explains the use of Cross Docking Software in the warehouse.

## 23.1 INTROCUCTION

The name "cross docking' explains the procedure of receiving goods through an inbound dock and then transferring them across the dock to the outbound shipping dock. Cross-docking is an operational procedure where products are directly transferred from incoming to outbound transport. Unlike traditional warehousing, you do not typically handle or store any product. Cross-docking reduces inventory and operation costs by eliminating unnecessary handling and storage.

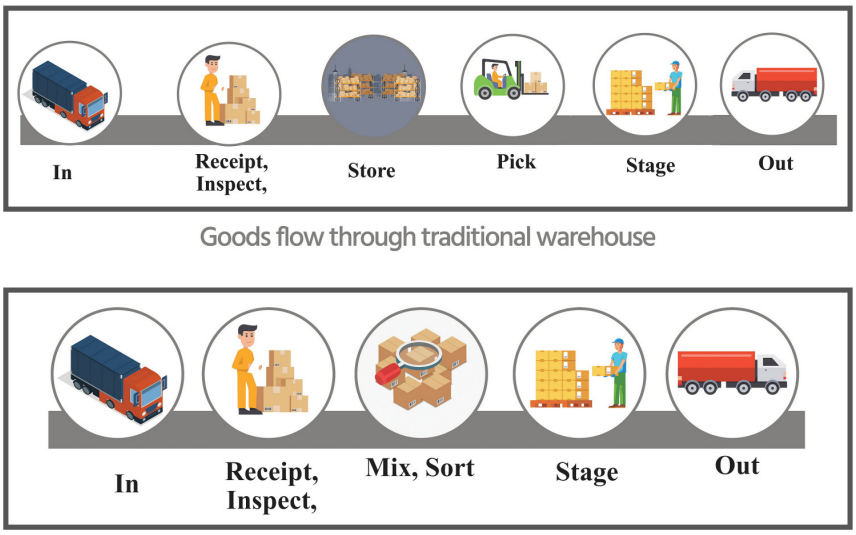



***Fig. 23.1:*** **Cross Dock Operation**

In easy terms, inbound goods enter through transportation such as trucks/trailers and are allocated to a receiving dock on one side of the cross dock' terminal. Once the inbound transportation has been docked its products can be moved either directly or indirectly to the outbound destinations; they can be unloaded, sorted and screened to identify their end destinations. After being sorted, goods are transferred to the other end of the cross dock terminal via a forklift, conveyor belt, pallet truck or other means of transportation to their destined outbound dock. When the outbound transportation has been loaded, the products can then make their way to customers.

Cross docking takes place in the allocation docking terminal: usually consisting of trucks and dock doors on two (inbound and outbound) sides with nominal storage space. Cross-docking is also considered a just-in-time (JIT) shipping method that skips over the step of warehousing products after they leave the supplier. In practice, this means that raw materials, components, or finished products are dispatched directly for delivery to the next stakeholder in the supply chain. That may be a manufacturer, shipping and logistics partner, wholesaler or distributor, or even the end consumer.

## 23.2 METHODS FOR USING CROSS-DOCKING IN BUSINESS

A cross-docking system can be implemented in several ways, depending on the type of business and products it sells.

### 1. Continuous cross-docking

The simplest type of the three types, continuous cross-docking is designed so products



are nearly always in transit. In a central cross-docking terminal, inbound and outbound vehicles are scheduled, so one is available for transfer as soon as a new delivery arrives. Continuous cross-docking creates a non-stop logistics flow, with the only wait time being when products are loaded between vehicles.

### 2. Consolidation arrangements

It's common for a single shipment to be combined with other shipments. For example, if one shipment contains relatively few products, it wouldn't be efficient to use up an entire vehicle for delivery. In these cases, consolidation cross-docking includes setting aside a small area in the terminal for short-term storage. Once there are enough smaller shipments, they are then combined and justify moving to the next leg of delivery.

### 3. Deconsolidation cross-docking

As one can quickly guess, de-consolidation cross-docking is the exact opposite of consolidation cross-docking. In deconsolidation cross-docking, either a larger shipment is divided into smaller quantities and then shipped to their next destination, or individual products are immediately sent directly to the final customer.

- **A main reason cross docking is implemented is to:**

1. Provide a central site for products to be sorted and similar products combined to be delivered to multiple destinations in the most productive and fastest method. This process can be described as "hub and spoke"
2. Combine numerous smaller product loads into one method of transport to save on transportation costs. This process can be described as 'consolidation arrangements'.
3. Break down large product loads into smaller loads for transportation to create an easier delivery process to the customer. This process can be described as 'deconsolidation arrangements.
4. Inventory storage costs are one of the most significant expenses a company incurs during a product's life. In fact, storage costs can get as high as 67% of your total warehousing costs, especially if the product ends up as excess inventory or dead stock. This is where cross-docking comes in — saving you both time and money.
5. Cross docking can progress the supply chain for a diversity of precise products. For one, perishable or temperature-controlled objects such as food which require to be transported as speedily as possible can be benefitted by this method. Additionally, previously packaged and sorted goods prepared for transportation

to a particular customer can become a quicker and more competent practice through cross docking.

6. Speed and cost are important deliverables in Supply Chain. Cross docking is one such method to enable it. The inbound goods are immediately for outbound with minimal handling, storage and value addition, several situations or products make themselves convenient for cross docking to be practised.

### 23.2.1 Cross docking strategies

Cross docking strategies can be further categorised by the load level that outgoing shipments are broken into:

A. **Load Unit Level:** In load unit level cross docking, pallets are transferred intact from one form of transportation to another. There is little to no handling of the products at the facility and they are simply moved from one vehicle to another. It is simple, quick, and cost-effective with little overhead.

B. **Case Level:** Products are shipped out in cases or as individual cartons. Essentially, larger incoming loads arrive on pallets and are offloaded and broken down to individual boxes. They are then shipped out as individual parcels. The redistribution is determined by the individual Stock Keeping Unit (SKU) on the carton. This is the model that underlies most online retail sales and delivery, and final distribution is usually through parcel services.

C. **Mixed Case Level:** Cross docking at the mixed case level requires the most labour and equipment. Incoming pallet loads are not transferred as-is or merely broken up; instead, they are unpacked, sorted, and redistributed onto new pallets for final shipment to the end customer.

In most cases, cross docking as a supply chain strategy involves implementing all of the above methods, sometimes in the same facility. The biggest challenge is keeping those channels that are working with different load sizes connected without error. In addition to the size of the lots being transferred, there are also multiple methodologies used for cross docking at every individual transfer station that also need to be managed.

#### a. Cross docking in receiving and distribution

Cross docking distribution centres are essentially transfer stations with little to no storage space. However, cross docking also takes place at large warehouses and distribution centres that specialise in storing large quantities of products. In these cases, the practice of cross docking is usually applied only to a small proportion of the products that the

warehouse handles. Cross docking may be applied in different ways as the business model of a specific location dictates, such as:

- **Opportunistic Cross Docking:** In many distribution centres, cross docking only occurs when circumstances require it. Priority items for which a customer paid extra for urgent delivery or products that arrive late may skip the usual processing and proceed straight to the loading dock in order to meet a deadline. Cross-docked products may be shipped individually or be combined with inventory in the warehouse for the final shipment as needed to fulfil the order.

- **Hybrid Cross Docking:** In this model of cross docking, both long-term storage of products and quick throughput of products without storage are a normal part of operations. Cross-docked products are regularly combined with products that are stored long-term. The resulting mixed case loads are then shipped out.

- **Consolidated Cross Docking:** Distribution centres that combine incoming shipments from two forms of transportation are consolidating loads. The rapid throughput of these locations means that there is little need to store products for any length of time; they are effectively large-scale product transfer stations. They can be found close to manufacturing points, where they create consolidated loads for long-range shipment by rail or sea vessel.

A warehouse or distribution centre may practise any or all of these forms of cross docking as its needs and circumstances dictate. While there are distribution centres that specialise solely in cross docking, they are in the minority. **Hybrid and opportunistic cross docking at warehouses is** the most common practice. The result is that for most logistics managers, cross docking as a supply chain strategy is a complicated and often attention- and resource-intensive task simply because it is an outlier operation. Since cross docking as a supply chain strategy is so unforgiving, it is advisable to make use of technology that supports the practice.

### 23.2.2 Cross Dock Warehouse

The cross docking process is profitable but will it suit all kinds of warehouses? What is important is to understand that it is beneficial for temperature controlled and unpreserved items like food that has short shelf life. The use of cross-docking for packed and sorted products, ready for transportation is best suited for cross docking. Informed decision is a must when a warehouse thinks of cross docking if this process will increase the productivity, customer satisfaction and cost for the business.

Cross-docking usually occurs at a warehouse or distribution docking terminal, where trucks can continuously come and go. There are often two separate sides for inbound

and outbound shipments, with a dedicated middle area to sort and pack inventory. Cross-docking requires a minimum of facilities. It just requires the staff for unloading and loading and the equipment and the space to segregate, label, or quality-check the goods as required. The space that is usually used for this in most warehouses is the marshalling yard.Most shipments typically spend less than 24 hours in a cross-dock before they are sent out to their final destinations.

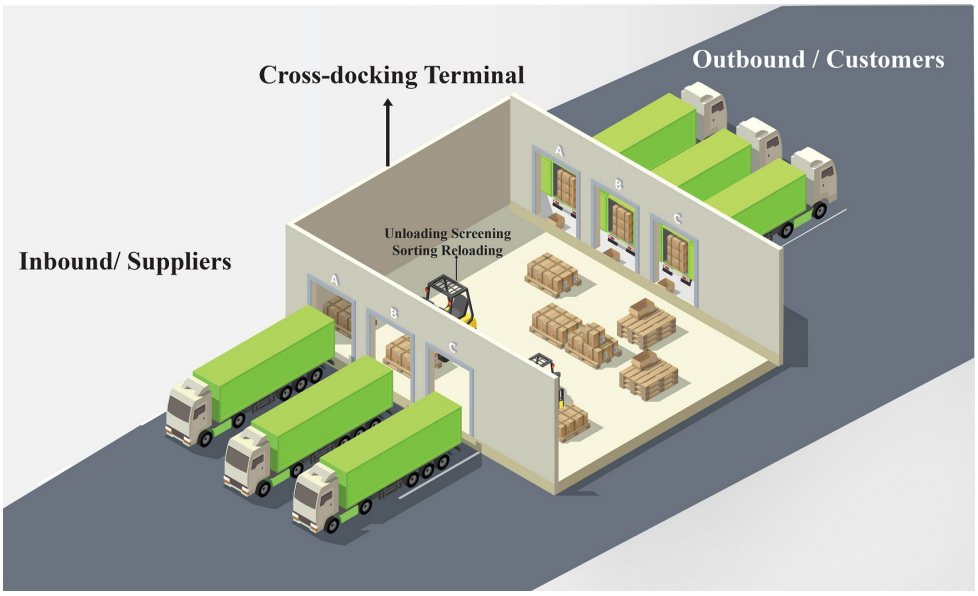



*Fig. 23.2:* **Cross docking in warehouse**

### A. Direct Shipment vs. Cross Docking

Direct shipping differs from cross-docking because products are sent directly from the supplier to the consumer. In most cases, the customer will purchase an item directly from the manufacturer. This method greatly reduces transportation costs but requires extra logistical planning and storage space for the seller. This method is popular amongst most apparel brands and many types of online businesses because they have complete control over what happens to the item before shipping.

### B. Cross Docking vs. Drop Shipping

Cross-docking and drop shipping are very different inventory management techniques that keep inventory from sitting in storage in your warehouse. With drop shipping, items are directly sold from your supplier to your consumer, meaning you will never touch any of the items yourself. In cross-docking, the product is shipped to your warehouse where it is sorted and immediately sent back out to the customers. Drop shipping is a popular inventory management technique because the seller doesn't have to pay for storage or any physical counts of inventory.



### 23.2.3 Benefits of cross docking

By cross-docking, businesses can experience several benefits.

#### A. Cost savings

By cutting back unnecessary warehousing operations, businesses can reduce expenditures on warehouse real-estate and the associated costs, including climate control, lighting, maintenance, and labour costs. In addition, by delivering products in a just-in-time fashion, businesses avoid the age-old problem of inventory depreciation.

#### B. Improved material handling

By removing redundant picking and packing steps, businesses reduce the opportunities for product damage. Furthermore, with items remaining in open staging areas, workers can inspect orders to ensure damaged products are not sent out.

#### C. Speed of delivery

Cross-dock operations not only boost efficiency by eliminating unnecessary touches, but distribution centres are strategically located near customers for timely dispatch and delivery. With faster dispatch and delivery, businesses can achieve improved customer satisfaction.

#### D. Capacity

While cross-docking reduces the need for warehouse space, it brings the need for more terminal and dock space, as well as more transport vehicles. Distribution centres must have the facilities, know-how, and technology to make this work.

#### E. Precision

Trading bulk orders and bulk storage in favour of smaller JIT shipments requires a great deal more precision. Companies must be able to track individual items throughout the supply chain at the speed of travel. Getting the right products to the right place will require well-trained personnel, carefully planned storage space, and accurate order tracking software.

#### F. Control

Organisations that don't have a well-built shipping and logistics arm will find it necessary to entrust this function to a cross-docking operations services provider. This entails relinquishing some control after orders are handed off. A trustworthy partner with integrated systems will be key in maintaining the visibility of operations and quality of service.

## INTEXT QUESTIONS 23.1

1. Define cross docking?
2. What are the major benefits of cross docking?
3. Items are directly sold from supplier to consumer is _____
   a. Drop shipping
   b. Direct shipping
   c. Cross docking
   d. All these

## 23.2 TYPES OF CROSS DOCKING

Cross-docking can be broken down into two basic types: Pre-Distribution and Post-Distribution.

### 23.2.1 Pre-Distribution vs. Post-Distribution Cross-Docking

**A. Pre-distribution cross-docking** is usually done earlier in the supply chain or is done by companies with vertically integrated supply chains. Under this method, goods are sorted and loaded before they leave the supplier, and already have customer delivery instructions. With Pre-Distribution, goods are unloaded, sorted, and repacked according to predetermined distribution instructions. In other words, the customer is identified before the goods even leave the supplier. Retailers like Wal-Mart, for example, receive all types of products to massive distribution centres and then sort the items for delivery to specific store locations.

**B. Post-distribution cross-docking** occurs at a dedicated distribution centre or cross-docking facility after goods have left the supplier. Disparate orders and items will be re-sorted and combined onto the appropriate transport vehicle at the dedicated facility. This type of cross-docking is used for less than truckload (LTL) orders, in which numerous smaller orders are put together. Alternatively, it breaks down larger bulk orders into smaller individual ones.

### 23.2.2 Other Cross-Docking Types

There are numerals of cross-docking scenarios that are existing to the warehouse management. Companies will use the sort of cross-docking that is appropriate to the



kind of goods that they are shipping.

A. **Manufacturing Cross-Docking**: This process involves the getting of purchased and inbound products that are required by manufacturing. The warehouse may receive the goods and organise sub-assemblies for the production orders.

B. **Distributor Cross-Docking:** This method consolidates inbound goods from diverse merchants into an assorted product pallet, which is delivered to the client when the final item is received. For example, computer parts distributors can buy their components from diverse vendors and merge them into one shipment for the client.

C. **Transportation Cross-Docking**: This operation combines shipments from a number of diverse carriers in the less-than-truckload (LTL) and small-package businesses to achieve economies of scale.

D. **Retail Cross-Docking:** This progression engages the receipt of goods from several vendors and sorting them onto outbound trucks for a quantity of retail stores. This method was used by Wal-Mart in the 1980s. They would acquire two types of goods, items they sell each day of the year, called staple stock, and bulky quantities of goods that are purchased once and not usually stocked again. This second type of procurement is called direct freight, and Wal-Mart minimizes any warehouse costs with direct freight by using cross-docking and keeping it in the warehouse for as little time as possible.

E. **Opportunistic Cross-Docking**: This can be used in any storehouse. It involves shifting a product straight from the receiving dock to the outbound shipping dock to meet a client sales order.

### 23.2.3 Products Suitable for Cross-Docking

#### A. Which type of business and products are a good fit for cross-docking?

Cross-docking is based on the just-in-time principles to pull materials into production only as needed. Many automobile companies were early adopters of cross-docking within their manufacturing plants and distribution systems. Beyond heavy industries like automobile production, cross-docking is highly effective for high-volume, high-demand items and perishable goods. Consider these product categories for cross-docking implementation:

- Perishable items with low shelf-life
- Cold food chain items

- Food and beverage
- Staple retail products with consistent demand
- Promotional items and new product releases
- Chemicals

Of course, items like perishable goods and cold food chain products cannot sit on the receiving dock for too long—otherwise, they would spoil and need to be recalled. To make sure items move swiftly through the supply chain, your organisation will need to have advanced item tracking capabilities with barcoding, QR codes, or RFID tags that automatically submit real-time data to your order management system for end-to-end fulfilment visibility

There are resources that are healthier suited to cross-docking than others. The list beneath shows a number of kinds of material that is further appropriate to cross-docking.

- Perishable items that require immediate shipment
- Superior objects that do not need quality inspections during goods receipt.
- Products that are pre-tagged (barcodes), pre-ticketed, and ready for sale
- Promotional objects and items that are being launched
- Staple retail goods with a constant-demand or low-demand variance
- Pre-picked, pre-packaged client orders from another manufacture plant or warehouse Information required for coordinating Cross Docking

### 23.2.4 Companies That Use Cross-Docking

Cross-docking can be an extremely beneficial operational system. However, specific industries reap more rewards from cross-docking than others. Here are the most common types of companies that use cross-docking:

- **Food and Beverage Industry:** Restaurants need a steady stream of supplies to operate smoothly. Cross-docking decreases the chances of any food spoilage because products move quickly through the supply chain, with no storage involved.
- **Consumer Goods:** Due to big-named brands like Amazon and Walmart, most consumers expect goods in hand immediately. Businesses now need to keep up and offer the same services consumers have grown accustomed to. Cross-docking helps companies move items faster and avoid costly storage fees.



- **Automotive Industry:** Cross-docking has been a staple of the automotive industry for decades because it relies on just in time delivery. This means that the production process only begins when a customer places an order and inventory stock is delivered as needed.
- **Chemicals:** Chemical products have specific storage requirements, making them both expensive and dangerous to ship. They should be handled as minimally as possible and be sent directly to the customer, which cross-docking allows.

### 23.2.5 Checklist for proper cross docking

- Ensure the proper coordination of freight coming into the warehouse operations and the outbound freight is properly loaded and coordinated to deliver at the intended destination.
- For the efficient and timely coordination of freight to reach its final destination proper maintenance of all required communications to dispatch, load planners, load validators, and designated management.
- Work with the Cross Dock Supervisor to develop, monitor and manage a component ace of assigned drivers/equipment to monitor schedules, track and execute cross dock functions
- For the efficient and timely entry of all company and customer related data into the company Cross dock software and/or related software in the Cross dock department.
- Coordinating and training drivers and material handlers in the cross-dock function to perform duties: planning, assigning, and directing work, addressing grievances and resolving troubles.
- Ensure all department required forms and documents are accurate and completed in a timely manner.
- Responsible for monitoring and obtaining KPI and Productivity goals as established by the Cross Dock Supervisor and determined by the company and/or their customers.
- Follow all workplace processes and standards in support of the ISO-9001 Quality certification program.
- Report all safety and performance issues to management immediately.
- Other duties as assigned.

## INTEXT QUESTIONS 23.2

1. List the types of cross docking
2. Which companies are suitable for cross docking?
3. _____ products are suitable for cross docking
   a. Perishables
   b. Cold food chain items
   c. Food and beverage
   d. All these

## 23.4 ADVANTAGES AND DISADVANTAGES OF CROSS DOCKING

**A. Advantages of cross docking are:**

**a. Reduces Storage Space:** Companies generally spend less amount per square foot of warehouse space. Cross-docking allows you to reduce your storage space, contributing to overall cost savings.

**b. Reduces Inventory Carrying Costs:** It costs money to store, manage, count, secure, and insure inventory. Further, when inventory spoils or is damaged, you lose out on more money. Cross-docking reduces inventory costs because items are going immediately from inbound to outbound transport, with little to no holding involved.

**c. Increases Overall Product Quality:** Cross-docking reduces the risk of damage to your products because most items aren't stored in a warehouse. Damage tends to occur when you are continuously moving products in and out of storage, and this logistical process eliminates that.

**d. Decreases Shipping Time:** Cross-docking dramatically reduces the time it takes to ship items. As soon as inventory reaches your warehouse, you move it swiftly from one truck onto another and ship it out to the customer. Products reach the distributor, and customer, faster

**B. Disadvantages of cross docking are:**

**a. Process Is Time-Consuming:** To be successful, cross-docking needs to be properly planned and executed. This can help prevent any scheduling conflicts and other mishaps

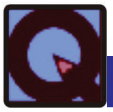


that can happen when warehouse management systems are not in place. Shipments should not spend more than 24 hours in a warehouse or distribution centre.

b. **It's Expensive:** Setting up a cross-docking operation isn't cheap. You would have to have access to a lot of capital to set up dock terminals and purchase a large number of transport vehicles to service your business.

Because products aren't put away in the company's prescribed fashion during cross-docking, there's an increased risk related to loss of inventory control by using the method in the long term.

Understanding the advantages and disadvantages of cross-docking and identifying how they fit with business or organisation is important. It is a significant factor for assessing and increasing productivity in the network cycle. So make sure to comprehend these critical factors. For instance: High Volume products, fast selling items, and Perishable goods are a perfect fit for Cross-Docking.



## INTEXT QUESTIONS 23.3

1. Give any two advantages of cross docking
2. What is the major disadvantage of cross docking
3. An increased _____ related to loss of inventory control occurs by using cross docking.

   a. risk  b. appeal

   c. rewrd  d. delay

## 23.5 USING CROSS DOCKING SOFTWARE

In order to run a successful cross-docking operation, you should invest in a warehouse management system. The right software will analyse your data and create a management plan from scratch. Most warehouse management software has the following capabilities:

A. **Electronic Advance Ship Notice Transmission**: Transmits data in real-time for inbound and outbound products

B. **Barcode Scanning:** Provides inventory accuracy by integrating data from computers and UPC barcode scanners

C. **Inbound and Outbound Freight Management Systems:** Input data from received and shipped products

**D. Workforce Planning:** Helps track and schedule shipments to ensure all operations run smoothly

The advantages of leveraging a WMS solution for executing cross-docking that led to cost optimization are as follows:

- A considerable reduction the labour overheads
- Reduced material handling hazards and time
- Reduction in the time required to ship the product to the customers
- Greater control and visibility over the distribution process
- Reduced warehousing costs as well as ancillary costs like insurances
- Overall improvement in warehouse management efficiency
- Reduced risk of proliferation
- Increase in the warehouse facility's utilisation rate
- Reduction in transport costs as multiple packages with common destinations are shipped together

Most enterprise resource planning (ERP) systems and warehouse management software (WMS) solutions struggle with the automation of cross-docking steps for both planned and reactive back-order fulfilment cross docking. These processes tend to be quite manual, which can make them prone to errors. While a distribution centre may be saving the labour and travel time associated with putting the product away and then re-picking it, the steps involved in using cross-docking as a receiving process can be cumbersome, manual, and verification intensive.

The ideal cross-docking software solution processes the receipt of the item, just as any other received products are processed, updates the ERP with what's been received so the vendor can be paid, and then immediately processes the fulfilment of an order or multiple orders with that product, routing those orders to staging for shipping, with nominal, if not any additional steps required.

## INTEXT QUESTIONS 23.4

1. Give the use of cross docking software?
2. Which is an ideal cross docking software?



3. Transmits data in real-time for inbound and outbound products is _____

   a. Electronic ASN transmission
   b. Barcode scanning
   c. Freight management system
   d. None

## WHAT YOU HAVE LEARNT

### Cross docking

- operational tactic that moves objects through consolidation centres or cross docks without putting them into storage space
- explains the procedure of receiving goods through an inbound dock and then transferring them across the dock to the outbound shipping dock.
- reduces inventory and operation costs by eliminating unnecessary handling and storage.
- also considered a just-in-time (JIT) shipping method that skips over the step of warehousing products after they leave the supplier

**Continuous cross-docking:** Creates a non-stop logistics flow, with the only wait time being when products are loaded between vehicles

**Consolidation cross-docking:** Includes setting aside a small area in the terminal for short-term storage.

**Deconsolidation cross-docking:** Either a larger shipment is divided into smaller quantities and then shipped to their next destination, or individual products are immediately sent directly to the final customer

**Pre-distribution cross-docking:** Goods are sorted and loaded before they leave the supplier, and already have customer delivery instructions.

**Post-distribution cross-docking:** Occurs at a dedicated distribution centre or cross-docking facility after goods have left the supplier.

**Manufacturing Cross-Docking:** Involves the getting of purchased and inbound products that are required by manufacturing.

**Distributor Cross-Docking:** Consolidates inbound goods from diverse merchants into a assorted product pallet, which is delivered to the client when the final item is received

**Transportation Cross-Docking:** Combines shipments from a numeral of diverse carriers in the less-than-truckload (LTL) and small-package businesses to achieve economies of scale

**Retail Cross-Docking:** Engages the receipt of goods from several vendors and sorting them onto outbound trucks for a quantity of retail stores

**Opportunistic Cross-Docking:** Involves shifting a product straight from the receiving dock to the outbound shipping dock to meet a client sales order.

## KEY TERMS

Cross Docking
Pre-Distribution Cross-Docking
Post-Distribution Cross-Docking
Just in time
Direct shipping
Drop shipping
Opportunistic cross docking
Flow-through cross docking
Distributor cross docking
Manufacturer cross docking
Food & Beverage
Cross docking terminal

## TERMINAL EXERCISE

1. Define cross docking.
2. Give the types of cross docking.
3. What is post distribution cross docking?
4. What is the major benefit of cross docking?
5. Which products are suitable for cross docking?
6. How do companies use cross docking?
7. Discuss the benefits of cross docking.
8. Explain the procedure involved in cross docking.
9. List the advantages and disadvantages of cross docking.
10. What is cross docking software?



11. What is deconsolidated cross docking?

12. Discuss the main reasons to use cross docking and what strategies are used in this?

13. Brief about Direct Shipment vs. Cross Docking and Cross Docking vs. Drop Shipping.

14. Discuss about the cross docking software in WMS.

15. HowBusinesses use cross-docking to improve their supply chains? Illustrate an example?

16. Describe the products that are suitable for cross docking and also the different users?

## ANSWERS TO INTEXT QUESTIONS

### 23.1

1. Cross docking is defined as an operational tactic that moves objects through consolidation centres or cross docks without putting them into storage space.

2. Cross-docking reduces inventory and operation costs by eliminating unnecessary handling and storage.

3. Choice a.

### 23.2

1. Pre-distribution cross-docking and post-distribution cross-docking

2. Companies suitable for cross docking

   - Food and Beverage Industry
   - Consumer Goods
   - Automotive Industry
   - Chemicals

3. Choice d.

### 23.3

1. Advantages of cross docking are:

   - Reduces Storage Space & Reduces Inventory Carrying Costs

2. Disadvantages of Cross Docking

   - Process Is Time-Consuming and Expensive.

3. Choice a.

**23.4**

1. In order to run a successful cross-docking operation, you should invest in a warehouse management system. The right software will analyse your data and create a management plan from scratch.

2. The ideal cross-docking software solution processes the receipt of the item, just as any other received products are processed, and updates the ERP with what's been received so the vendor can be paid.

3. Choice a.

## DO AND LEARN

Cross docking implementation requires a variety of needs. To understand this new concept the students could assume any type of perishable commodity and try to perform in groups or take up the various activities in the cross docking operations as done at warehouses to learn the intricacies in this technology

## ROLE PLAY

Cross docking is very beneficial to manufacturers and retailers handling bulk and perishable goods that require quick movement to various points. Now, assume that Anand, branded coconut chips producer and Parthiban, retailer of P Mart chain stores are interested in using cross docking operations to reduce costs and time in their businesses. Assume the role of these two people and come out with chats towards the use of cross docking technology.

Anand: ……

Parthiban: …..

24

# WAREHOUSE HANDLING EQUIPMENT

Material handling (MH) involves "short-distance movement that usually takes place within the confines of a warehouse and between a building and a transportation agency". It can be used to create "time and place utility" through the handling, storage, and control of material, as distinct from manufacturing (i.e., fabrication and assembly operations), which creates "form utility" by changing the shape, form and makeup of material.

Material handling refers to the storage, control, protection and movement of products and material throughout warehousing, consumption, manufacturing, disposal and distribution. Many kinds of equipment and systems exist from manual to fully automated options to help conduct material handling. Using material handling equipment is crucial for making sure a supply chain runs well.

## LEARNING OUTCOMES

After studying this lesson the learner:

- defines the principles and importance of MHE;
- identifies the categories of warehouse MHE;
- explains the use and select the right type of MHE;
- finds the advantages of MHE.

## 24.1 PRINCIPLES OF MATERIAL HANDLING

Although there are no definite "rules" that can be followed when designing an effective MHS, the following "Ten Principles of Material Handling," as compiled by the College-

Notes



Industry Council on Material Handling Education (CIC-MHE) in cooperation with the Material Handling Institute (MHI), represent the distillation of many years of accumulated experience and knowledge of many practitioners and students of material handling:

A. **Planning Principle:** All MH should be the result of a deliberate plan where the needs, performance objectives, and functional specification of the proposed methods are completely defined at the outset.

B. **Standardisation Principle:** MH methods, equipment, controls and software should be standardised within the limits of achieving overall performance objectives and without sacrificing needed flexibility, modularity, and throughput.

C. **Work Principle:** MH work (defined as material flow multiplied by the distance moved) should be minimised without sacrificing productivity or the level of service required of the operation.

D. **Ergonomic Principle:** Human capabilities and limitations must be recognized and respected in the design of MH tasks and equipment to ensure safe and effective operations.

E. **Unit Load Principle:** Unit loads shall be appropriately sized and configured in a way that achieves the material flow and inventory objectives at each stage in the supply chain.

F. **Space Utilisation Principle:** Effective and efficient use must be made of all available (cubic) space.

G. **System Principle:** Material movement and storage activities should be fully integrated to form a coordinated, operational system which spans receiving, inspection, storage, production, assembly, packaging, unitizing, order selection, shipping, and transportation, and the handling of returns.

H. **Automation Principle:** MH operations should be mechanised and/or automated where feasible to improve operational efficiency, increase responsiveness, improve consistency and predictability, decrease operating costs, and to eliminate repetitive or potentially unsafe manual labour.

I. **Environmental Principle:** Environmental impact and energy consumption should be considered as criteria when designing or selecting alternative equipment and MHS.

J. **Life Cycle Cost Principle:** A thorough economic analysis should account for the entire life cycle of all MHE and resulting systems.



### 24.1.1 Importance of MHE

Material handling equipment can greatly benefit companies in diverse industries. Many companies enjoy how material handling systems and equipment improve their workplace's efficiency and safety. Additionally, material handling equipment can reduce waste, lower costs and optimise a facility's space. Here are some of the most significant benefits of using material handling equipment:

- **Greater efficiency:** One of the biggest advantages of material handling equipment is its ability to process items efficiently. Outfitting the facility with relevant material handling equipment can reduce production stoppages by improving the circulation of materials around a facility. Many different types of material handling equipment can help to get the materials to key locations faster and maintain a more consistent flow, increasing efficiency as a result.

- **Reduced waste:** When a company relies on manual labour or improper equipment to handle its materials, its materials are much more likely to get damaged during transportation and storage, leading to higher material and product waste. Outfitting the facilities with material handling equipment can reduce waste significantly. For example, stacking frames can keep crushable items safe while stacked over one another, and forklifts can securely transport pallets to various locations.

- **Lower costs:** Another major benefit of material handling equipment is its ability to help a company lower its costs. When using equipment designed to make systems more efficient and speed up processes, it can increase profitability due to decreased work stoppages and errors. Additionally, material handling equipment reduces waste; meaning'll reduce costs related to replacing damaged materials and products.

- **Better use of warehouse space:** can use various types of material handling equipment, particularly storage and handling equipment, to save space in warehouse. For example, you can install mezzanines to receive a second level of storage in the warehouse and tall racks to increase vertical storage capabilities. Additionally, side loaders allow placing aisles more closely together. Due to the better use of warehouse space, it can significantly increase warehouse capacity.

- **Increased employee safety:** A major benefit of using material handling equipment is that it reduces the need for staff to do strenuous manual labour. Since regularly lifting and hauling heavy materials by hand leads to chronic injuries, machinery designed to do these tasks for them can increase employee safety. Secure storage devices and machinery also prevent materials from falling and hurting staff.

## INTEXT QUESTIONS 24.1

1. What is meant by material handling?
2. Give the role of MH
3. _____ creates "time and place utility"

   a. Material Handling

   b. Transport

   c. Supply chain

   d. manufacturing

## 24.2 CLASSIFICATIONS OF MATERIAL HANDLING EQUIPMENT

The classifications of material handling equipment are as follows:

A. Storage Equipment

B. Material Handling Equipment (Movement Equipment)

C. Safety Equipment


*Fig.24.1:* **Warehouse**



### 24.2.1 Storage equipment used in warehouses

- Storage in Racks - Normal Racks, High Racks, Deep Racks etc.
- Bin storage - Plastics bins
- Storage in Sacks & Silos-like Wheat, Rice, Chemicals, Fertilisers etc.

Storage equipment is also one way of ensuring the operational area of the warehouse remains clean, organised and clutter-free. The most productive warehouses are those which have efficient lats. Using a simple mechanism of shelving and sectioning, storage equipment makes it possible for various materials to be rearranged, while avoiding major accidents or potential delays.

Following are the various storage solutions available.

***Table 24.1:*** **Storage equipment used in warehouses**

| Name | Description |
|---|---|
| Selective Pallet Racking | Selective Pallet Racking is the simplest & economical racking system which allows 100% accessibility to each pallet. This racking is suitable for large variety of 'SKU's irrespective of quantity |
| Heavy-duty Racks | Heavy duty shelving is a simple storage solution which facilitates storage of non palletized items. Ideal for a large variety of medium to big sized items that can be handled manually. |
| Long span Shelving Racks | Long span Shelving is ideally suited for items: which are light/medium in weight and voluminous in nature. This type of racking is used for Auto, Retail, Engineering Sectors. |
| Bin Racking | Usually used in Spares parts to store smaller items. |
| Slotted Angle Racks | This shelving is a versatile system best suited for storage of small components, bins, carton shaving light loads up to (300 kgs) level. |

| | |
|---|---|
| Mezzanine Flooring | Column based Mezzanine floor system is a light| weight steel flooring system provided at a suitable height above the ground. The system can be configured to suit the last of the room, taking into account pillar positions, door positions etc. |
| Heavy Duty Mobile Racks | Comprises electrically driven trolleys which move sideways closing up the space, normally used for aisles. The mobile trolleys run on wide surface flange and high grade steel rails to distribute the imposed loads across the floor evenly. |
| Cantilever Racking System | Generally used where the need is to hang the products like tyres. |
| Drive throughRacking System | |

Warehouse storage is usually of the bulk or rack variety, where bulk storage pallets are typically just stored on a floor and where rack storage pallets are stacked on racks to make use of higher ceiling space. Typical rack warehouse storage equipment as similar to above figure includes pallet racks and wire decking, heavy-duty shelving, cantilever racks, reel racks, and, sometimes, high-density storage systems such as drive-in racking, push back racking, and pallet flow racking. Inventory systems such as FIFO (first in, first out) have some bearing on which of these high-density systems are suitable. Aisle space is referred to as narrow aisle (NA) or very narrow aisle (VNA) and can place a limit on lift manoeuvrability. A typical counterbalanced lift truck needs at least 11 ft. of aisle width to turn around. Three-wheel pallet jacks are often employed in warehouses due to their improved ability to navigate through tight corridors.

### 24.2.2 Material Handling Solutions

Handling technology has evolved so much that it has changed the entire traditional concept of the warehouse. Material handling is an important part of material management at a warehouse. Physically moving material requires equipment of various kinds, depending upon type and amount of material to be moved. Moving material around a warehouse involves lifts and trucks of many kinds, such as pallet jacks, lift trucks, hand trucks, scissor lifts, stackers, etc. Special designs such as narrow-aisle forklifts are available for

high-density storage schemes. Wire-or rail-guided reach trucks are sometimes employed in narrow-aisle warehouses to maximise the use of storage space. Such automation, known as automated storage and retrieval, can reduce personnel requirements – at a cost. Often, such systems use horizontal or vertical carousels for the storage of stock. Special attachments are available for forklifts for handling unpalletized loads such as paper rolls or storage drums.

Conveyor systems of various kinds are also employed in some warehouses for the movement of picked goods. Both gravity and live roller conveyors are common as are skatewheel conveyors. Temporary, flexible conveyors are sometimes used as well. Warehouse management such as keeping tabs on materials and goods moving to, from, and through a warehouse is often aided by the use of mobile workstations and handheld devices. With such equipment available to them, warehouse workers are able to move throughout the warehouse and have necessary data such as pick lists immediately at hand. Barcoding and RFID tags are used to further streamline the process. Warehouse management software is used to track the flow of goods through a facility, including receiving, putaway, picking, shipping, and inventorying. Regardless of the picking method or the nature of the picking (piece, case, pallet), a rule of thumb says that the items moved most frequently should be stored closest to the pick point to minimise transit times, which make up a large portion of most picking cycles. Following are some of key material handling equipment used inside the warehouse:

***Table 24.2:*** **Material Handling Solutions**

| Name | Description |
|---|---|
| Pallet Jacks | Move heavy loads upto 6,000lbs. Handle includes a three-position (raise, lower, neutral) lever for fingertip control and one-hand operation. |
| Integrated Dock Leveller | Innovative designs for both integrated and edge of dock levellers are available. |
| TruckRestraints | Truck restraints help to maximize loading dock safety and productivity. Eliminates trailer creep and won't allow driver to pull away while still loading. |
| DockSeals and Shelter | Dock seals and shelters are designed to reduce energy loss, theft, product damage and insect infiltration |

| | |
|---|---|
| Strip Doors and Air Curtains | Reduce the loss of heated and cooled air while preventing the flow of dust and contaminants from parking or loading areas with these energy efficient doors. |
| LargeCeiling Fans | High volume low speed ceiling fans are capable of generating significant energy savings for large spaces. One fan can cover up to 20,000 sq.ft. of space |
| Caranes and Hoists | Free-standing bridge cranes reduce operator fatique when operating hoists, balancers, or manipulators continuously over multiple shifts |
| Dollies | Move heavy equipment, boxes, and other bulky items with steel or wood dollies (Related products- roller dollies, lever truck, pallet dollies, triangle dollies, wood dollies, and casters) |
| Trucks | Choose from wooden, steel, aluminium, or plastic work trucks (Related products. Platform truck, stocking truck, wagons, self propelled, security truck, and wire truck. |
| Utility Carts | Make transportation of tools and material easy. Hundreds of uses in the shop or office (Related products - Utility carts, shop truck, ergonomic carts, and ladder carts) |

### 24.2.3 Safety equipment

Safety is another key aspect of warehousing. The people, material and equipment should be saved from any accident. Following are some of the safety equipment used inside the warehouse.

*Table 24.3:* **Safety equipment**

| Name | Description |
|---|---|
| Emergency Wash Station | Emergency station shower is activated via at triangular pull handle, while the eyewash activates with a steel push handle |

| | |
|---|---|
| Antifatique Mats | Exceptionally buoyant mats feature raised deck-plate surface providing exceptional slip resistance. Cushions legs and spine increasing employee productivity, morale and physical well-being, Grease- and chemical - resistant |
| Barrier Raills | Easy to install barricades protect valuable equipment and workers from hazards in the workplace. 11-ga. steel components absorb impact of a 13.000-lb, load at 4 mph |
| Bollards | Heavy duty bollards provide a physical barrier between fork trucks and valuable equipment. This short post, generally 3-5 feet in height, is used to create either a visual or protective perimeter |
| Column Protectors | Universal rack protectors guard posts from damaging impact that can be caused by heavy machinery. |
| Wire Partitions | Wire enclosures work well as tool rooms, security cage, or hazardous material. |
| Traffic Visibility Mirrors | Wide angle convex mirrors designed to increase surveillance, provide security, and promote safety. |
| Handrails | Safety guardrails make overhead walkways and mezzaines safe with easy to install guardrails |
| Miscellaneous Equipments | A wide range of products for warehouse. distribution center, or manufacturing plant. (Related products Floor signs, waste containers, Chairs, Shop stools, and tables). |

Worker safety is a primary concern in a busy warehouse. Racks are often buttressed at their ends to protect them from forklift collisions. Racks are usually fenced or enclosed along one side to avoid boxes from being pushed through and falling during handling. Many lifts are equipped with overhead guards to protect operators against injury from falling stock. Pickers wear appropriate harnesses to protect them from falls.

### 24.2.4 Other MHE

#### Industrial Trucks and Forklifts

Industrial trucks and forklifts cover a broad category of equipment. The one thing they

have in common is that all of the pieces of equipment help with transportation. Industrial trucks and forklifts are available in a range of sizes. These industrial trucks come in two main types: stacking and non-stacking trucks.

- A non-stacking truck is only for transportation.
- A stacking truck can load products and stack them.

Usually, industrial trucks have attachments like insert able flat surfaces or forks to make the transportation process easier. These attachments to fit under pallets for quick and easy picking. Industrial trucks lift materials through manual or powered means. Powered industrial trucks usually have a cab, making it easy for the operator to pick up heavy material. Some power-assisted industrial cabs have to be pushed into position but can still lift materials via controls. Additionally, some more advanced industrial trucks can be automated, using optical sensors and predefined pathways to move along the warehouse floor. Some of the primary types of industrial trucks include:

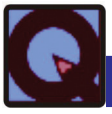
- **Hand trucks:** Sometimes referred to as a dolly, hand platform trucks are some of the most basic forms of industrial trucks. They usually feature a handle for leverage and a small platform to set heavy objects on that would be difficult to carry. The operator tips the equipment onto the handle and rolls the equipment to wherever the item needs to go.
- **Platform and pallet trucks:** Platform trucks are a type of hand truck that have wider platforms and sit low to the ground. Pallet trucks, or forklifts, are designed to lift pallets. They'll slip under a pallet, and then an operator will steer the pallet wherever it needs to go. These types of trucks come in both manual and electrical forms.
- **Sideloaders:** Sideloaders are built to fit in narrow aisles. They pick up items from different directions, making them ideal when a warehouse is using more of their space by placing aisles close together.
- **Walking stackers:** A walking stacker lifts and moves materials like a forklift. Though they don't come with a cab for an operator, they can come in electric versions to assist with transportation.
- **Pallet jacks:** One of the common types of warehouse equipment, pallet jacks are a very basic form of a forklift. They're used to move materials around a warehouse and are often manually pushed, though there are powered options as well.
- **Order pickers:** An order picker lifts operators high off of the ground and allow them to get too hard-to-reach materials on high shelves.



## Bulk Material Handling

Bulk material handling equipment refers to the equipment that stores, controls and transports materials in bulk. Usually, the materials will be in a loose form. This type of equipment typically handles beverages, metal items, minerals, food and liquid. An example of a bulk material handling system is the use of a conveyor belt to move materials from one area of the production floor to another. 'll see hoppers and drums funnel loose items into areas where the items can be packaged or manipulated in some way. Common examples of this type of material equipment include:

- **Stackers:** These pieces of bulk material handling move items from one point to another. Stackers are automated and will place various items and products onto stockpiles.
- **Conveyor belts:** One of the key parts of a conveyor system is a conveyor belt. They usually utilize pulleys or drums to rotate the belt and move material on it across a facility.
- **Reclaimers:** A reclaimer is a large machine used to pick out materials from stockpile.
- **Bucket and grain elevators:** Bucket elevators are sometimes called grain legs. They help to transport bulk materials vertically. Grain elevators move materials along a production pathway, as well as store it.
- **Hoppers:** Hoppers are shaped like funnels and are used to dump or pour materials into containers. They can close off their opening and hold onto the material until it needs to be released.
- **Silos:** Common on farms, but useful in a variety of facilities, a silo is a tower that holds materials. Common materials stored in silos include grain, woodchips, coal, sawdust and food.



## INTEXT QUESTIONS 24.2

1. How MHE are classified?
2. Give examples for bulk handling equipment?
3. _____ is referred as dolly

   a. Hand trucks  b. Hoppers

   c. Stackers  d. Pallet truck

## 24.3 USE OF MATERIAL HANDLING EQUIPMENT'S IN A WAREHOUSE

Forklifts, reach trucks, order pickers and pallet trucks are the typical parts of the material handling equipment (MHE) fleet. Anything that relates to the movement, storage, control and protection of materials, goods and products throughout the process of manufacturing distribution, consumption and disposal is part of this category of equipment. Used to increase output, control costs, and maximize productivity, warehouse management has a number of ways to determine how efficient is the use of the material-handling equipment in any kind of operation.

Uses of Material handling equipment are as follows:

- Reduce manufacturing cycle time
- Reduce delays, and damage
- Promote safety and improve working conditions
- Maintain or improve product quality
- Promote productivity
    - Material should flow in a straight line
    - Material should move as short a distance as possible
    - Use gravity
    - Move more material at one time
    - Automate material handling
- Promote increased use of facilities
    - Promote the use of building cube
    - Purchase versatile equipment
    - Develop a preventive maintenance program
- Control inventory

### 24.3.1 Selecting the Right Materials Handling Equipment

With all of the benefits of using bulk material handling equipment, any one might be interested in investing in such equipment. So, learn more about the main considerations want to take when determining the right equipment:

A. **Material type:** Start by defining what kind of material'll be handling. The weight,

size and shape of the material, as well as if it's gas, solid or liquid, can all affect what kind of material handling equipment 'll need. If a piece of equipment can't handle materials efficiently or safely, remove it from the list.

B. **Facility of space:** The amount of space facility will affect the equipment choice. Different types of warehouse equipment are more suited for smaller or larger spaces. Before choosing the equipment, ensure it can reach materials, fit between aisles and safely navigate the space.

C. **Production flow:** When company has a consistent production flow between two fixed positions, it can likely use a full conveyor system. However, if production flow faces a lot of change,'ll likely want to prioritize machinery that can easily change directions and navigate new routes around the facility.

D. **Operation types:** Besides the production flow, may want to take into account the types of operations regularly perform. For example, rental equipment can be better for temporary operations, while buying a piece of equipment can be better for permanent operations. Additionally, it's important to understand if material flow pattern is horizontal or vertical.

E **Expense:** As to pick any equipment, need to consider whether it is affordable or not. Also want to consider the maintenance and operating costs of various pieces of equipment to ensure're getting the most value for money.

F. **Structural factors:** Before selecting any equipment, ensure its compatible with facility's structural factors. For example, the material handling equipment should work with the facility's structural strength, door and ceiling dimensions and floor conditions.

G **Reliability:** Any company knows the value of reliable equipment, as it keeps their production flow running smoothly and avoids expenses related to maintenance. Ensure the most reliable equipment possible and comprehensive after-sale support.

## INTEXT QUESTIONS 24.3

1. Give the prime use of MHE
2. Which major criteria you will find in selecting the MHE
3. Before choosing equipment, ensure it can reach the materials, fit between _____ and safely navigate the space

   a. Aisles  b. Route

   c. Spaces  d. All these

## 24.4 ADVANTAGES OF MHE

MHE is crucial for the success of a company as it looks to handle material efficiently. Improper storage and handling can cause product loss, damaged material and inefficiency in the supply chain. To avoid these issues, investment in material handling equipment designed should be made for the needs of every company and the materials they handle. Below are some of the ways a good material handling system can provide distinct advantages to a company:

### A. Reduce Material and Product Waste:

A common issue warehouses and facilities face is the lack of proper storage systems and the presence of equipment that mishandles materials. These issues can lead to products becoming damaged or wasted during the storage or transportation process. This material waste can lead to higher costs for the company handling the material and dissatisfied clients who expect their products to be well cared for.

Proper warehouse storage equipment will ensure items in the warehouse are stored safely. For instance, stacking frames can help a company keep crushable materials stacked on top of each other without harming the items. Improved warehouse transportation equipment also helps to move materials more efficiently and safely, reducing the chances that materials get dropped or harmed. Additionally, a material handling system can help companies keep a more accurate track of their inventory. For instance, proper shelving and organizational features help companies know exactly where to find products and keep track of them when they need to be moved. Computerized systems can automatically track inventory and ensure always have the correct number of products.

### B. Lower Material Handling Costs

One of the biggest concerns of those who use material handling equipment in their business is to lower their cost. Much of a company's production process is built around material movement, procurement and storage. These aspects of the process can cost a significant amount of money, especially if the material handling system is inefficient. If a material handling system can't handle the flow of materials efficiently, stoppages can occur, leading to new costs and lower profitability.

Proper material handling equipment and systems will keep the production process running smoothly. Fully automated systems can ensure there's no guesswork in handling product and reduce the chance of user error. Even proper manual equipment can help a company better handle material, ensuring it gets to point A to point B efficiently. The higher initial costs of more sophisticated equipment are well worth it, as they help a company handle more material with greater speed and efficiency. In the long-term, 'll lower costs associated with errors, damaged equipment and work stoppages.

## C. Greater Warehouse Capacity

Optimizing a warehouse's capacity to hold more goods is one of the most important things one can do to increase profitability. With appropriate storage and handling equipment, can use more of the warehouse's space for increased storage capacity.

Sideloaders allow to place aisles closer together, as they can easily fit in between them and pick out equipment from either side. Another example of warehouse equipment opening up floor space is the use of racks, stacking frames and mezzanines. With this storage and handling equipment, can stack pallets and materials higher safely. By increasing the warehouse's capacity, it can hold more goods without increasing storage costs. Efficient storage means efficient production. As a result, can raise overall production ability and potentially raise profitability.

## D. Better Work Conditions and Worker Safety:

Manually lifting materials and transporting them can be very time-consuming and strenuous for workers. Workers can get burnt out doing this kind of manual labor and run a higher risk of injuries. With equipment, make their work much easier, freeing them up for more tasks and creating a more enjoyable workplace. Also reduce the chance that mistakes happen, which makes it so managers have much fewer headaches to manage during the workweek.

Additionally, when automating much of the material handling process and giving staff powerful equipment to handle heavy loads, make the workforce much safer for employees. Lifting heavy materials can cause many chronic injuries, especially if workers aren't properly trained. Improperly stored material could also fall on workers, hurting them a great deal. MHE in warehouses helps workers conduct these strenuous tasks, lowering their chance of injury.

## E. Better Material Flow

Often, materials enter a facility i n a raw form and exit in the form of completed products or goods. If the facility handles multiple steps of a production process, the material needs to flow smoothly. Not having the proper warehouse equipment can lead to stoppages in production. For instance, an improper material handling system could cause product damage or delay material from reaching the appropriate stage.

With an improved system and pieces of equipment, improve material's circulation around the facility. The material will get to the needed stations and locations faster, ensuring flow stays consistent. A positive side effect of the improved material flow is that it causes materials to stay in the facility for shorter periods of time and gets to consumers faster.

## F. Improved Distribution

Ability to deliver final goods to wholesalers and retailers is crucial to these clients' satisfaction. Not having MHE and other warehouse equipment can cause products to get to clients much slower. Poor storage and packaging equipment and systems can lead to damaged products. Damaged products and slower distribution are a recipe for dissatisfied clients.

With the best material handling equipment in the corner, I can make sure products are stored safely and distributed properly. A conveyor system, for example, can move products through different stages of the production process and get them in position for distribution.

## G. Conclusion

Building Warehouse and managing it is a large investment. Like any other investment this investment too will demand a return on investment (ROI). The warehousing space is a cost and needs to be utilized in the best possible manner. All possible ways need to be adopted to maximize its utilization. MHE reduces human efforts and allows safe and quick storage and retrieval of material. Different kinds of rack are available to utilize the height or the space and store material vertically. Similarly, forklifts and reach stackers can be used to unload the materials and move within the warehouse. The safety equipment ensures the safety of the people operating in the warehouse. Right set of MHE are critical for the success of the warehouse. Technologies like AGV have completely overturned the concept of man going to material. It is material which is now coming to man. Blockchain, IOT, AI, Big data all newer technologies are not impacting other fields of business but Supply Chain too in a large manner.

## INTEXT QUESTIONS 24.4

1. List the advantages of MHE
2. What is sideloaders
3. An improper material handling system could cause product _____

   A. Damage

   B. Delay

   C. Only a

   D. Both a & b

## WHAT HAVE YOU LEARNT

| | |
|---|---|
| ***Material handling*** | • "Short-distance movement that usually takes place within the confines of a warehouse and between a building and a transportation agency"<br>• used to create "time and place utility" through the handling, storage, and control of material (i.e., fabrication and assembly operations)<br>• can reduce waste, lower costs and optimize a facility's space |
| ***Work Principle*** | • MH work (defined as material flow multiplied by the distance moved) should be minimized without sacrificing productivity or the level of service required of the operation. |
| ***Better use of warehouse space*** | • Install mezzanines to receive a second level of storage.<br>• tall racks to increase vertical storage capabilities.<br>• Sideloaders to place aisles more closely together. |
| ***Storage equipment*** | • ensures the operational area of the warehouse remains clean, organized and clutter-free. |
| ***Pallet Jacks Industrial trucks*** | • Move heavy loads upto 6,000lbs<br>• A non-stacking truck is only for transportation.<br>• A stacking truck can load products and stack them. |
| ***Bulk material handling equipment*** | • typically handles beverages, metal items, minerals, food and liquid. |
| ***Uses of Warehouse handling equipment*** | • Reduce manufacturing cycle time<br>• Reduce delays and damage<br>• Promote safety and improve working conditions<br>• Maintain or improve product quality<br>• Promote productivity<br>• Promote increased use of facilities<br>• Control inventory |
| ***Role of Safety equipment*** | • people, material and equipment saved from any injury, damage, accident. |

## KEY TERMS

Material handling, Greater efficiency, Reduced waste

Lower costs, Better use of warehouse spaceIncreased employee safety

Storage equipment, Handling equipment, Safety equipment

Industrial Trucks and Forklifts, Bulk Material Handling

## TERMINAL EXERCISE

1. What is warehouse equipment?
2. What is storage equipment?
3. What is safety equipment?
4. What is bulk material handling?
5. What is the use of a narrow aisle?
6. What is the use of warehouse equipment?
7. Explain the function of storage equipment?
8. What type of safety equipment is available in the warehouse?
9. Differentiate stackers and hoppers?
10. How Industrial Trucks and Forklifts are utilized?
11. Explain the importance and benefits of handling equipment?
12. Describe the various storage and safety equipment?
13. Discuss about the bulk material handling equipment?
14. Describe the selection criteria of material handling equipment?
15. Brief about the advantages of handling equipment?



## ANSWERS TO INTEXT QUESTIONS

### 24.1

1. Material handling refers to the storage, control, protection and movement of products and material throughout warehousing

2. Warehouse handling equipment can reduce waste, lower costs and optimize a facility's space.

3. a. Material Handling

### 24.2.

1. A. Storage Equipment

   B. Material Handling Equipment (Movement Equipment)

   C. Safety Equipment

2. Conveyor belts and Bucket and grain elevators

3. a. Hand trucks

### 24.3.

1. Reduce manufacturing cycle time

   Reduce delays, and damage

   Promote safety and improve working conditions

   Maintain or improve product quality

2. Material type

   Facility lat

   Production flow

   Operation types

   Expense

   Structural factors

   Reliability

3. d. All these

24.4

1. Reduce Material and Product Waste, Lower Material Handling Costs, Greater Warehouse Capacity, Better Work Conditions and Worker Safety, Better Material Flow and Improved Distribution

2. Sideloaders allow to place aisles closer together, as they can easily fit in between them and pick out equipment from either side.

3. Damage

## DO AND LEARN

The students would have used equipment for various purposes in their houses and in reality, it could be discussed among them to have an idea of how equipment or machinery helps them to make their work easier.

## ROLE PLAY

A group of students could visit nearby godowns/regulated markets/marketing yards/ distribution centers of retailers and see how the materials are handled with the use of simple equipments and another group could learn the same operations in milk depos, fruit and vegetable collection centers for their practical exposure and similar kind of exercise they could practice by assuming the role of handling various equipments.

25

# METHODS OF VARIOUS MATERIAL HANDLING SYSTEMS IN WEREHOUSE

There is a large amount of heavy labour involved at warehouse and logistics worksites, such as loading, unloading and transporting cargo. Material handling device is a general term for the machines used to make this logistics work more efficient. Material handling is the movement, protection, storage and control of materials and products throughout manufacturing, warehousing, distribution, consumption and disposal.

These machines perform a variety of tasks including moving raw materials, work in process, and completed products. Material handling refers to a comprehensive set of tasks, including movement, packing and unpacking, storage, protection, and control of products and materials. From manufacturing and warehousing to distribution and disposal, material handling systems are valuable to every operation. Various types of material handling systems are employed in various industries. Automotive, food & beverage, consumer goods, construction, E-commerce, healthcare, and retail, are a few examples of industries that witness a wide application of material handling systems.

## LEARNING OUTCOMES

After studying this lesson the learner:

- identifies the types of MHE in warehouse;
- defines manual MHS and its merits & demerits in warehouse;
- finds the semi-automated MHS and its merits & demerits;
- explains automated MHS and its merits & demerits.

## 25.1 TYPES OF MHS

As a process, material handling incorporates a wide range of manual, semi-automated and automated equipment and systems that support logistics and make the supply chain work.

A. Manual Material Handling or MMH is the process of handling or moving materials using manual labour. MMH includes pushing, pulling, lifting, retrieving, controlling, carrying, and holding. Though manual, this type of handling requires the use of equipment such as manual cranes, pallet trucks, slings and hooks, short-distance conveyors, and forklifts.

B. Semi-automated material handling systems are a great alternative to full warehouse automation. Semi-automated systems will allow maintaining competitiveness without investing as much as for full automation.Semi-automation is a system that utilises automated machinery with human labour and intervention. So, the machine exists to *enhance* the processes that employees are performing.

C. Automated materials handling (AMH) refers to any automation that reduces or eliminates the need for humans to check-in, check-out, sort material, or to move totes and bins containing library material. The mechanical equipment used in AMH systems includes check-in machines, sorters, conveyors, singulators, stackers and unstackers, totes, bins, trolleys, and tote carriers.

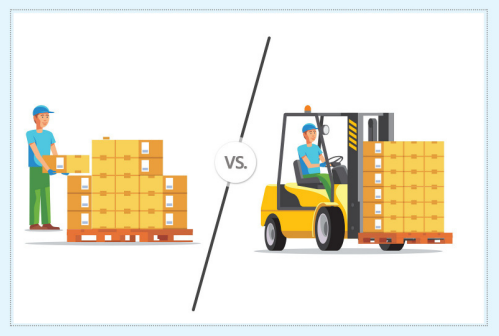



***Fig.25.1:*** **(a) Manual Vs Semi automated MHS;**

***Fig. 25.1:*** **(b) Automated Material Handling System**

## INTEXT QUESTIONS 25.1

1. What are the different types of material handling systems?
2. The mechanical equipment used in AMH systems is _____

   a. hooks
   b. slings
   c. manual cranes
   d. check in machines



## 25.2 MANUAL EQUIPMENT HANDLING

It is one of the most conventional materials handling strategies in the world where operators move around the building or warehouse to locate, retrieve, and store goods and materials. Although manual, it does involve the use of powered machines such as forklifts and small overhead cranes. Manual material handling systems have a slow speed compared to the automated ones. They also lack scalability and agility as you can't program a manual system to handle more than one operation. The manual system may lead to errors and inaccuracies as they rely on human labour. But they require low initial investment costs and need to invest in training new employees. As the initial investment is low, manual material handling systems can offer a relatively quick return on your investment. As a result, they are quite popular among small and medium enterprises.

Manual material handling systems are more suitable for operations that aren't repetitive or predictable and employees may not need technical skills as they don't have to operate advanced machines. In manual material handling, you will mostly need to rely on your workers to lift, move, push, pull, store, and retrieve goods and products. However, you will need to use lifting handling equipment such as hooks, slings, manual cranes, forklifts, trucks, short distance conveyors, side-loaders, pallet jack and pallet trucks, and manual retrieval and storage equipment. Manual systems may not have higher productivity owing to the error-prone inventory management and other order fulfilment processes. It is also highly time-consuming. Improper handling of heavy loads and the injuries and deaths resulting from these errors are a primary concern for manual material handling systems and do need safety training.

### A. Merits of Manual Material Handling System

a. **Cost-Saving –** Manual material-handling does not require a heavy initial investment. It is easy to set up these systems. As initial investment is low, return on investment is quick to be realised.

b. **Easy for Employees to Adapt –** Manual material handling systems do not involve advanced technology. So, there is no intense employee training required. There is a necessity for safety training though to ensure that employees handle equipment safely.

   Since this system does not require employees to have technical expertise, it becomes easier for them to adapt to the new environment.

c. **Availability of Greater Space** – Manual system does not involve the use of extensive or heavy equipment, which increases the amount of usable space.

d. **Improves Process Efficiency** – Involvement of experienced and well-trained employees ensures efficient task completion. As manual factor is involved, dynamic

processes, which see a change of parameters frequently, can be completed with great efficiency.

e. **Ensures a Safe Working Environment** – With regular safety training, employers and employees become aware of the safety precautions they need to implement while handling materials manually. As a result, the workspace is safer and accidents due to negligence are minimised.

f. **Attracts Employees** – Since manual material handling depends on labour, retaining as well as attracting new employees are crucial. A good and safe workspace based on the principles of a material handling system is sure to retain and attract employees.

g. **Facilitates Better Customer Service** – Well-trained labour, increased process efficiency, and improved productivity, lead to better delivery times and increased customer satisfaction.

### B. Demerits of Manual Material Handling

a. **Difficulty to Scale** – Manual material handling can be employed for only one process at a time. If your business scales up and your operation needs to handle multiple operations simultaneously, then manual handling cannot match the demand.

b. **Error–Prone** – Human intervention makes manual material-handling prone to errors and inaccuracies. For example, there could be errors in inventory management and order fulfilment.

c. **Mandatory Safety Training –** Employees need safety training to handle equipment and operations without the risk of injuries or death. Such training needs to be undertaken regularly to keep employees up-to-date with new and updated safety practices.

## INTEXT QUESTIONS 25.2

1. Give examples of equipment used in manual handling?
2. What is the main demerit in manual handling?
3. _____ is more suitable for operations that aren't repetitive or predictable and employees may not need technical skills

   a. MMH  b. AMH

   c. SMH  d. None



## 25.3. SEMI AUTOMATION MHS

Semi-automation allows one to customise which portion of the warehouse is automated and which parts will be manually run. This allows you to decide how much automation your operation needs, which can range from a mostly conventional warehouse with minimal automation to one that is close to being fully automated but with minimal human interaction.

Semi-automation offers many benefits. Whether only a small fraction of the warehouse will be automated, or the majority of your operation, here are some of the advantages it can offer.

A. **Flexibility and room to grow:** One advantage of semi-automation is that you can always go to more or full automation in the future. So, you can start slowly with your operation, with the intent of going to full automation at some point once you're able to or more comfortable with it.

B. **Allows for human intervention:** Human intervention may be important for some operations. Semi-automation allows for human intervention where necessary. Due to the flexibility semi-automation offers, you are able pick and choose which processes will be automated and which are done manually.

C. **Faster return on investment:** As stated earlier, there is an investment that comes along with automating your warehouse to any degree. Even with the initial investment, the return on investments (ROI) that comes from semi-automation tends to be faster than with full automation, since these systems are typically less expensive.

Every semi-automated warehouse can look different. This is because

a. **Reduces employee error:** Many warehouse tasks such as picking and placing can become repetitive and therefore guarantees some type of human error. Using an automated system to assist with picking and placing orders will significantly decrease error rates.

   For example, pick-to-light and put-to-light are semi-automated systems that assist employees with picking and placing orders. Integrating this semi-automated element into the picking and placing process has been shown to provide up to 99.6% pick and place accuracy.

   Pick-to-light systems and put-to light systems are lighted displays attached to the pick face of each SKU. The lighting configuration can be customised to the distribution centre's needs. These displays can be fixed to any type of racking or shelving system, whether it be existing or new build.There are many advantages of implementing pick-

to-light and put-to-light systems. Such as:

- Reduction in picking and placing errors: it's been shown to provide up to 99.6% picking and placing accuracy.
- Reduced labour costs: these systems allow more productivity per operator.
- Relatively low hardware and install cost compared to other automation options.
- Low hardware and install cost for automation: these can be installed right to the pick face via a plastic channel tek-screwed.
- Shortened order fulfilment cycle times.
- Reduced training time for new employees.

### b. Improves employee safety:

There are a number of ways that semi-automation allows operations to increase employee safety.

First, employees often no longer have to take on tasks that require tough manual labour. Instead, the system will perform this portion of the tasks. For example, vertical lift modules bring the product right to the picker. The product is presented at the optimal height for the picker, so they no longer have to stoop to pick a product from the bottom levels or reach up high to pick product from upper levels.

Additionally, many semi-automated systems allow for employees to be more aware of their surroundings. For example, voice picking directs the picker via a headset, so the picker doesn't have to constantly be looking down to reference paper or RF transmitters.

Voice picking systems are automated picking systems that can be much more efficient than picking via paper or RF transmitters. With voice picking, the operator does not have to 'look down' to reference their next steps. This results in higher accuracy as well as seconds saved with each step, Advantages include:

- Increased pick accuracy.
- Increased pick volume per worker.
- Reduced new employee training (up to 50%).
- Safety incidents reduced by 5% to 20%.

### c. Increases picking speed:

Semi-automation can take away the repetitive tasks performed by employees. After hours of completing the same tasks, manual picking times are shown to decrease. An



automated picking system allows for the system to continually pick products at the same speed and then deliver it to an employee.

An example of this is a vertical lift module. VLMs have been shown to increase picking speed up to 800%. This is due to the machine taking on the task of presenting each item directly to the picker, so that the picker doesn't have to walk the aisles searching for each product.

Pallet runners are semi-automated deep lane storage systems that deliver pallets via a cart that runs on a track within the racking system. It's also commonly referred to as a pallet shuttle system. Pallet runners essentially allow the entire volume of your warehouse to be utilised. The carts can be outfitted to suit a wide variety of pallet designs and can be used for first-in, first-out (FIFO) or last-in, first-out (LIFO).

Some of the benefits pallet runners offers are:

- Reduced rack damage and product damage.
- High storage density (deep lanes).
- Each level is independently accessible, resulting in less honeycombing.
- Does not require particular lift trucks to operate.
- Can be designed for both FIFO (first-in, first-out) and LIFO (last-in, first-out) storage.
- Controlled product flow, not relying on gravity.
- Not affected by varying pallet weights.

A vertical lifting module (VLM) is a vertically standing, semi-automated storage system. In this system, trays are stored in the front and the back of the system, with an opening on out outside of the system that allows for product to be delivered directly to the operator.Some advantages associated with VLM's are:

- Reduced labour costs.
- Increased picking speed accuracy.
- Increased warehouse space.
- Increased control of inventory and tools.
- Improved ergonomics.
- Flexible and modular, the system can grow with you.

**d. Expedite the order fulfilment process:**

Semi automatic with conveyors. Conveyors can be a great way to add an element of automation in operation to expedite the order fulfilment process. Simply put, conveyors move products from point A to point B. There are many options to accommodate what needs to happen in between point A and point B within conveyor types. The conveyor is used to get products from the racking system quickly over to fulfilment to be packed and shipped. This way, a forklift driver doesn't have to travel the farther distance from the racking to the packing area.

## INTEXT QUESTIONS 25.3

1. Give the advantages of semi-automated Material handling?

2. semi-automated element into the picking and placing process has been shown to provide up to _____ pick and place accuracy

   a. 99.6%  b. 100%  c. 98%  d. 97.9%

## 25.4 AUTOMATED MATERIAL HANDLING SYSTEMS

Automated material handling systems are pre-programmed computerised systems with built-in technology for task completion. These systems feature advanced technology for material movement, storage, access, and location. Automated material handling may require manual interference for tasks such as picking, dropping, and pushing. Some examples of automated handling equipment include scissor lifts, dock levellers, pallet positioners, and automatic conveyors.

Automated systems are faster, more agile, and easily scalable. It can be adapted to carry out more than one task with careful planning and research. Automated systems require a substantial initial investment. The cost may go up further if it is a customised system. However, can compensate for these increased costs by saving on manual labour and increased productivity and order fulfilment precision. Automated systems can help optimise the warehouse and storage space as they allow you to utilise the vertical ceiling clearances.Automated systems require operators with technical skills. They also need to undergo the necessary training to operate the lifting and handling equipment. Automated systems, on the other hand, are suitable for repetitive or predictable order fulfilment processes.

**A. Automated Material Handling Merits**

**a. Increased Flexibility** – Automated systems are flexible. If you are scaling your operations, then you can program these systems accordingly to handle more than



one process at a time. With proper planning, you can use automated systems to scale up or downsize in real-time.

b. **High Cost-Efficiency** – Automated systems save money in the long run. The technology may be expensive, especially if it is a customised product. But the cost can be compensated because manual labour is reduced. With automation, tasks can be performed faster and with precision, which increases productivity.

c. **Enhanced Workplace Safety –**With automated handling, employees will not have to lift or carry around heavy weights, which reduces the risk of trip-and-fall accidents. Risks of physical problems such as lower back pain, back injuries and fatigue, are also minimised.

d. **Space Optimization** – Space can be used with maximum efficiency. For example, automated equipment such as forks enables access to spaces located higher. This space can be used to stack products without wastage. Products can also be retrieved faster and with ease through the use of automated handling systems. Existing space is used to create more space and is used efficiently.

e. **Enhanced Order Fulfilment and Delivery** – Automated handling minimises errors in order handling, improves shipping process, and quickens delivery. As a result, customer service has improved.

f. **Better Employee Morale** – Employees with technical expertise will show interest in your business. A workstation that protects employees from accidents and injuries is an attractive draw for employees experienced in material handling and logistics. It leads to retaining existing employees and attracting new employees.

## B. Automated Material Handling Demerits

a. **Initial cost of equipment:** Automated equipment is more expensive up front than manual equipment. However, whatever saved in man power and gained in increased productivity, means the equipment will eventually pay for itself and then some.

b. **Reduced flexibility for change:** Once automated systems are in place, it is likely not as easy to make changes in the workspace. But once automated and see how smoothly everything runs, it's not likely all will return to manual equipment afterwards.

c. **Possible downtime due to malfunction:** With automatic machines there is always the chance of a problem or breakdown, which can lead to considerable downtime while it is repaired. If the problem cannot be fixed by anyone on site, an outside specialist may need to be called, which could mean more time spent waiting.

d. **Maintenance costs:** Some automated equipment needs maintenance. Routine maintenance may be performed regularly by onsite workers, but periodic professional

maintenance should be handled by specialists who are trained to inspect and tune-up machinery so that it runs smoothly and efficiently. Then I have to depend on them periodically.

## INTEXT QUESTIONS 25.4

1. What is automated MHS
2. With automation, tasks are performed faster and with precision, which increases __

   a. productivity  b. safety

   c. morale  d. order fulfilment

## WHAT HAVE YOU LEARNT

**MMH:** Process of handling or moving materials using manual labour. MMH includes pushing, pulling, lifting, retrieving, controlling, carrying, and holding. Though manual, this type of handling requires the use of equipment such as manual cranes, pallet trucks, slings and hooks, short-distance conveyors, and forklifts.

**Semi-automated material handling:** Are a great alternative to full warehouse automation. Semi-automated systems will allow maintaining competitiveness without investing as much as for full automation. Semi-automation is a system that utilises automated machinery with human labour and intervention. So, the machine exists to *enhance* the processes that employees are performing.

**AMH :** Refers to any automation that reduces or eliminates the need for humans to check-in, check-out, sort material, or to move totes and bins containing library material.

## KEY TERMS

| | | | |
|---|---|---|---|
| Warehouse | logistics | raw materials | works in process |
| completed products | cargo | Material handling device | movement |
| packing | unpacking | storage | protection |

## TERMINAL EXERCISE

1. Expand MHS.
2. What is material handling?
3. What is manual material handling?
4. What is semi-automated handling?
5. What is an automated warehouse?
6. What are the types of MHE?
7. List a few manual handling equipment.
8. Give the demerits of manual MH.
9. State the merits of automated MH.
10. Mention the industries that use automation in MH.
11. Briefly explain the merits and demerits of MMHS.
12. Briefly explain the merits and demerits of Semi-automatedMHS.
13. Briefly explain the merits and demerits of AMHS.

## ANSWERS TO INTEXT QUESTIONS

**25.1**

1. Various types of material handling systems are MMHS, SAMHS and AMHS

2. d.

**25.2**

1. Hooks, slings and manual cranes 2. Cost saving 3. a.

## 25.3

1. Flexibility and room to grow, Allows for human intervention and Faster return on Investment

2. a.

## 25.4

1. Automated materials handling (AMH) refers to any automation that reduces or eliminates the need for humans to check-in, check-out, sort material, or to move totes and bins containing library material.

2. a.

### DO AND LEARN

The students could have used automated devices in their house. They could discuss the utility of the devices used by them in terms of benefits they attained and how they further decide on the use of such automated appliances in future.

### ROLE PLAY

Aravind and Baskar are the two friends who do trading activities in their towns. Aravind employs more labourers for his work but Baskar always uses semi automated and automated devices with minimum employees. They now start discussing the merits and demerits about their methods.

Aravind: Hello Baskar how are you and how is your work going?

Baskar: Fine Aravind. I want to discuss with you the use of equipments at work spot as I feel difficult to get enough number of labors every time and find difficult to manage with them

Aravind: Oh… I will explain to you the use of simple and cost effective equipment that can be used effectively?

Baskar: Thanks, tell me now the details.

Continue the conversation in your own way to convince Aravind on the use of equipments

26

# TECHNOLOGY FOR WEREHOUSE MANAGEMENT

A warehouse management system (WMS) is defined as software designed to manage the movement of inventory to know where final products and goods are at any time to fulfil orders. The purpose of a warehouse management system is to help organisations have an efficient warehouse by determining the best arrangement for storage and workflow. It tracks all forms of inventory so items can be quickly located and it helps to manage the supply chain by keeping track of what is needed and when. It supports the use of RFID tags, barcoding, and serial numbers. WMS software can even eliminate the need for periodic manual inventory counts. A Warehouse Management System (WMS) is a software application that supports the day-to-day operations in a warehouse and is a key part of the modern supply chain process. WMS programs enable centralised management of tasks such as tracking inventory levels, receiving, picking, put-away and identifying stock locations.

A WMS monitors the progress of products through the warehouse. It involves the physical warehouse infrastructure, tracking systems, and communication between product stations. More precisely, warehouse management involves the receipt, storage and movement of goods to distribution centres or to a final customer. Early warehouse management systems could only provide simple storage location functionality. Current WMS applications can be so complex and data intensive that they require a dedicated staff to run them. High-end systems may include tracking and routing technologies such as Radio Frequency Identification (RFID) and voice recognition. No matter how simple or complex the application is, the goal of a warehouse management system remains the same — to provide management with the information it needs to efficiently control the movement of materials within a warehouse.WMS software improves warehouse processes by providing organised methods for various warehouse activities that helps to reduce errors and improve employee satisfaction. With automated processes and greater communication,

a warehouse management system decreases costs, improves productivity, and enhances service.


*Fig. 26.1:* **Warehouse Management System**

## LEARNING OUTCOMES

After studying this lesson the learner:

- discusses warehouse automation and its process;
- summarizes the benefits and challenges of warehouse automation;
- classifies warehouse automation trends and costs;
- assesses the warehouse automation implementation with software.

## 26.1 WAREHOUSE AUTOMATION

Warehouse automation is the process of automating the movement of inventory into, within, and out of warehouses to customers with minimal human assistance. As part of an automation project, a business can eliminate labour-intensive duties that involve repetitive

physical work and manual data entry and analysis. For example, a warehouse worker may load an autonomous mobile robot with heavy packages. The robot moves the inventory from one end of the warehouse to the shipping zone and software records the movement of that inventory, keeping all records current. These robots improve the efficiency, speed, reliability and accuracy of this task. But warehouse automation does not require physical or robotic automation, and in many cases simply refers to the use of software to replace manual tasks.

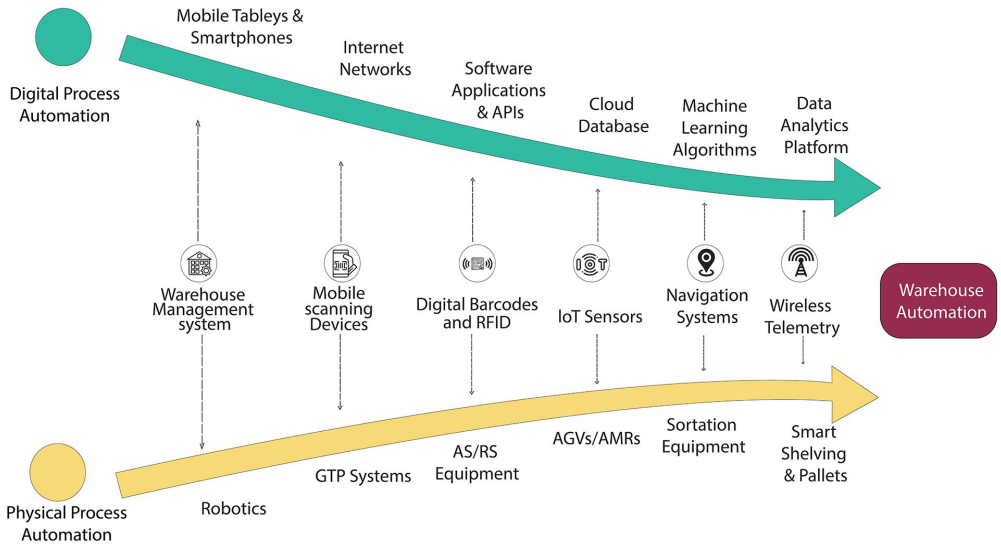



***Fig. 26.2:*** **Warehouse Automation**

However, this scenario illustrates how robots and humans work together to accomplish repetitive tasks while minimising fatigue and injury.

### 26.1.1 Digital Automation

Digital automation uses data and software to reduce manual workflows. Automatic identification and data capture (AIDC) technology, like mobile barcoding, is an example of digital automation in the warehouse. The benefits of digital process automation include the ability to integrate with enterprise resource planning (ERP) systems, enhanced security, greater data management efficiency, reduced operational and legal risks, and improved safety—but from the warehouse perspective, it reduces manual processes and eliminates human errors. AIDC technology like radio frequency identification (RFID) and mobile barcode scanning can enhance the worker experience, improve customer service and reduce operational costs associated with human error. Implementing digital automation technology requires a significant upfront investment. These costs include hardware, software and support contracts and the time and resources required to implement the systems and



train employees. In addition, digital automation can increase the risk of lost or corrupted data and cybersecurity threats.

### 26.1.2 Physical Automation in the Warehouse

Physical automation is a way to use technology to minimise employee movement and build more efficient workflows. Robots are one example of how it works in the warehouse. The advantages of physical automation include increased warehouse capacity and efficiency, enhanced reliability and scalability of services and improved performance. The downsides are the significant upfront expenses, the scarcity of a skilled workforce to manage and maintain the system, high maintenance costs and equipment that is meant for highly-specific functions. To take advantage of automated warehouse systems, businesses need advanced planning and organisation. These systems are more suited for large-volume warehouses and distribution centres with space to accommodate specialised equipment.

### 26.1.3 Categories of Warehouse Automation

Warehouse automation varies from relatively simple to quite complex. Basic automation uses planning, machinery and vehicles to reduce repetitive tasks. Advanced systems take advantage of artificial intelligence and robotics. Warehouse automation categories include:

A. **Basic Warehouse Automation:** This type of automation refers to simple technology that assists people with tasks that would otherwise require more manual labour. For example, a conveyor or carousel moves inventory from point A to point B.

B. **Warehouse System Automation:** This type of system uses software, machine learning, robotics and data analytics to automate tasks and procedures. For example, a warehouse management system reviews all the orders that need to be filled in a day and has users pick items to fulfil all those orders at once so they don't traverse the warehouse back and forth multiple times.

C. **Mechanised Warehouse Automation:** This kind of warehouse automation uses robotic equipment and systems to assist humans with warehouse tasks and procedures. Autonomous mobile shelf loader robots that lift racks of products and deliver them to human pickers to retrieve and sort is one example.

D. **Advanced Warehouse Automation:** Advanced warehouse automation combines mechanised warehouse robotics and automation systems that can replace labour-intensive human workflows. For example, a robotic forklift fleet that uses advanced AI, cameras and sensors to navigate a warehouse and communicate each forklift's location to an online tracking portal.



### 26.1.4 Types of Warehouse Automation Technology

There are many types of warehouse automation because there is a wide range of warehouse technology and systems available. Warehouse automation aims to minimise manual tasks and speed up processes, from receiving to shipping. Warehouse automation technology includes:

A. **Goods-to-Person (GTP):** Goods-to-person fulfilment is one of the most popular methods for increasing efficiency and reducing congestion. This category includes conveyors, carousels and vertical lift systems. When properly applied, GTP systems can double or triple the speed of warehouse picking.

B. **Automated Storage and Retrieval Systems (AS/RS):** AS/RS are a form of GTP fulfilment technology that includes automated systems and equipment like material-carrying vehicles, tote shuttles and mini-loaders to store and retrieve materials or products. High-volume warehouse applications with space constraints tend to utilise AS/RS systems.

C. **Automatic Guided Vehicles (AGVs):** This class of mechanised automation has minimal onboard computing power. These vehicles use magnetic strips, wires or sensors to navigate a fixed path through the warehouse. AGVs are limited to large, simple warehouse environments designed with this navigation layout. Complex warehouses with lots of human traffic and space constraints are not good candidates for AGVs.

D. **Autonomous Mobile Robots (AMRs):** More flexible than AGVs, AMRs use GPS systems to create effective routes through a specific warehouse. They use advanced laser guidance systems to detect obstacles, so AMRs can safely navigate dynamic environments with lots of human traffic. They are easy to program with routes and easy to implement quickly.

E. **Pick-to-Light and Put-to-Light Systems:** These systems use mobile barcode scanning devices synced to digital light displays to direct warehouse pickers where to place or pick up selected items. They can dramatically reduce walking and searching time and human error in high-volume situations.

F. **Voice Picking and Tasking:** The use of voice-directed warehouse procedures, also known as pick-by-voice, uses speech recognition software and mobile headsets. The system creates optimised pick paths to direct warehouse workers where to pick or put away a product. This method eliminates the need for handheld devices like RF scanners, so pickers can concentrate on their task with improved safety and efficiency.

**G. Automated Sortation Systems:** Sortation is the process of identifying items on a conveyor system and diverting them to a warehouse location using RFID, barcode scanners and sensors. Companies use automated sortation systems in order fulfilment for receiving, picking, packing and shipping.

## INTEXT QUESTIONS 26.1

1. Define warehouse management system
2. What is warehouse automation
3. Warehouse automation works by using software and technology like _____ to automate tasks.

   a. robotics and sensors

   b. inventory and storage

   c. receiving and shipping

   d. None

## 26.2 WAREHOUSE AUTOMATION PROCESS

Warehouse automation works by using software and technology like robotics and sensors to automate tasks. These products work in concert with existing tools like inventory management software. Warehouse automation helps ensure that business-critical operations meet customer demand. It starts with a warehouse management system (WMS) that automates manual processes and data capture, inventory control and supports data analysis. These systems integrate with other solutions to efficiently manage and automate tasks across different business and supply chain functions.

### 26.2.1. Five Steps to Automate Warehouse

Five-step plan to get started with warehouse automation.

**A. Create an implementation committee.**

Form a committee of internal stakeholders who have expertise on current warehouse performance, capabilities and challenges, and understand existing technology gaps. Consider adding third-party experts who know about supply chain automation and have experience relative to industry and warehouse operations.

### B. Collect critical data.

Successful warehouse automation relies on data about existing supply chain and business-critical warehouse operations. Before implementing new automation technology, evaluate the current data collection process and infrastructure. You'll want to assign ownership of data migration to skilled IT stakeholders.

### C. Evaluate inventory controls.

Inventory control is at the core of warehouse operations. Before implementing a warehouse automation solution, determine or refine standard operating procedures (SOPs) for inventory control. Include SOPs for purchasing, shipping, receiving, customer satisfaction and inventory loss. Define the key performance indicators (KPIs) to measure the success of automated inventory control processes and procedures. Evaluate the inventory accounting method currently in place (for example, periodic or perpetual systems) and determine how automation will impact it. Read the guide about inventory control to learn more.

### D. Implement a warehouse management system (WMS)

WMS platforms feature software modules that help control and track inventory, manage warehouse operations, reduce labour costs associated with manual tasks, and improve customer service. A modern WMS supports mobile devices and should be able to work with existing enterprise software.

### E. Determine what kind of warehouse automation you want

Is the goal to use automation to streamline manual data entry and reduce labour costs associated with back-office warehouse operations and accounting? Or, are you expanding warehouse footprint or adding locations and think it's time to use advanced physical process automation like robots and GTP systems? Determining the type of warehouse automation that aligns with goals and customer demand is essential.

## 26.2.2 Warehouse Processes that Can Be Automated

The right warehouse automation technology can automate tasks that touch every aspect of order fulfilment and inventory control, including:

A. **Receiving:** You can use mobile devices to quickly capture data in warehouse receiving area. Integrated software captures, processes and stores data that impacts downstream and upstream automated workflows.

B. **Returns:** Automated sorting systems and equipment like conveyors can automate

return processing procedures. Use them to sort products to return-to-stock shelves or put away in designated storage locations.


*Fig. 26.3:* **Warehouse Process automation**

C. **Putaway:** Putaway refers to the act of moving products from receiving to storage. Automating this process can also help facilitate cross-docking, where goods are rapidly sorted, processed and placed onto trucks bound for different destinations instead of being stored in the warehouse.

D. **Picking:** Manual order picking is the costliest warehouse activity—warehouse travel time can consume as much as 50% percent of working hours. Using GTP systems and autonomous mobile robots can rapidly increase the speed and efficiency of moving inventory from stock locations to fill customer orders.

E. **Sorting:** Sorting and consolidating warehouse inventory is a time-consuming, often confusing task. Automated sortation and AS/RS systems improve inventory accuracy and quality control by recognizing and handling small or fragile inventory separately.

F. **Replenishment:** Automated inventory tracking and cycle counting empower automated reorders. When an inventory item reaches a designated par level, the system automatically triggers an order request and flags it for approval. Automated replenishment can help prevent overstocking costs and inventory loss due to spoilage and theft.



**G. Packaging:** Automated packaging and cartonization systems use algorithms to determine the best type of shipping packaging based on product attributes (like durability), dimensions and material costs.

**H. Shipping:** Automated shipping systems uses conveyors, scales, dimension sensors, printers and software applications to determine available carriers, estimate shipping rates and apply labels to packages for shipment.

## INTEXT QUESTIONS 26.2

1. Automating process of a warehouse requires initially a _____

   a. project plan

   b. packaging

   c. replenishment

   d. sorting

2. Why Should You Automate a Warehouse?

## 26.3. BENEFITS OF WAREHOUSE AUTOMATION

Using automation to improve warehouse operations brings a wide range of advantages, from running more efficiently to minimising human error. Here's a list of the most commonly cited benefits:

- Increased warehouse throughput
- Better resource utilisation
- Reduced labour and operational costs
- Improved customer service
- Reduced handling and storage costs
- Reduced human error
- Minimised manual labour
- Increased productivity and efficiency
- Improved employee satisfaction
- Enhanced data accuracy and analysis
- Reduced stock out events
- Optimised warehouse space
- Greater inventory control
- Improved workplace safety
- Fewer shipping errors
- Reduced inventory loss
- Enhanced material handling coordination
- Improved order fulfilment accuracy

### 26.3.1 Challenges of Warehouse Automation

Despite the benefits related to warehouse automation, it also has some challenges. It requires significant capital to get up and running and expertise to establish and maintain the system, which many companies don't have in-house and can be difficult to find. Additionally, equipment can break down, often at the worst of times, leading to downtime and repair/maintenance costs.

To minimise maintenance issues, set up maintenance schedules. The high upfront costs for equipment and setup typically pay for themselves over time through efficiencies and increased sales, but businesses need to carefully anticipate and mitigate some challenges with proper risk assessment and planning. The planning phase should include regular inventory audits to verify the accuracy of new data from automated processing against existing records.

### 26.3.2 Examples of Warehouse Automation

The popularity and growth of ecommerce has increased the demand for warehouse automation. Here are some examples of how it works across various industries:

A. **Barcode Scanning:** Amazon uses automated barcode scanning and labels to dominate online retail and optimise warehouse operations. This automation is responsible for Amazon's famously innovative storage system. Unique barcodes are placed on incoming products and on the shelves where they reside. When it's time to ship a product, employees use the updated picking list to find the product location based on automated routes optimised for efficiency and flow.

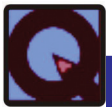
B. **Picking Automation with GTP Systems:** Nike implemented a GTP picking system in its new distribution centre in Japan. The automated GTP picking system uses autonomous robots to carry products and packages loaded on shelves or pallets directly to warehouse workers for order fulfilment. The new warehouse automation helped transform logistics and enable Nike to provide same-day delivery to customers in Japan.

C. **Inventory Automation with AS/RS Systems:** IKEA operates highly automated warehouse facilities worldwide. Its distribution centres feature AS/RS inventory automation systems and equipment, including 100-foot-tall trilateral stacker cranes and conveyor rack systems capable of automatically transferring 600 pallets an hour to dispatch areas.

D. **Back-Office Automation:** WMS platforms with digital process automation features can optimise back-office operations. Automation, a distributor of machine control



solutions and services to OEM machine builders, had siloed applications that slowed productivity, as staff had to manually import and export data across multiple systems to support sales and customer service teams. The company implemented NetSuite's Inventory Management, CRM and Manufacturing Execution System to enhance back-office sales and customer support functions with automated barcoding, case management and issue tracking solutions.



## INTEXT QUESTIONS 26.3

1. List any three benefits of warehouse automation
2. Give the major challenge in warehouse automation
3. Warehouse automation systems chosen should integrate with a ____ platform.

   a. WMS  b. Cycle count

   c. Supply chain  d. inventory

## 26.4 WAREHOUSE AUTOMATION TRENDS AND COSTS

### A. Warehouse Automation Trends

Warehouse automation will help address insufficient warehouse space, inefficient inventory operations and labour shortages. Online retail sales of physical goods are expected to approach $500 billion dollars, increasing warehouse services demand.More than 90% of warehouse operators report that cost-cutting measures are critical to successfully balance the need for more space and services and the difficulty of hiring and retaining a qualified workforce to meet demand. Failing to plan for these trends may cost more than the expenses associated with warehouse automation.

Here's a list of the digital and physical warehouse automation and robotics trends empowering the modern warehouse:

**a. Robotics:** The investment in warehouse robotics startups increased by 57% in the first quarter of 2020 to more than $380 million. The trend will continue to see momentum in a post-pandemic economy and areas with workforce shortages, like Japan.

**b. Cobotics:** Cobotics refers to a collaboration between person and robot (cooperation and robotics forms cobotics). Cobots, designed to work with people, do not replace human tasks. Cobots in warehouse automation include AMRs that can scan their environment. This cabot AMR can avoid collisions with humans and human-operated

machinery by recognizing changes in its 360-degree field of vision and can safely drive backward when necessary.

c. **Supply Chain as a Service:** Warehouse service-based markets are growing to fill the demand for flexible warehouse operations and automated technology like autonomous robots. Companies offering subscription-based, full-service automated warehouse solutions seek to replace manufacturers and service providers that offer automated equipment and system sales.

d. **Blockchain Technology:** Blockchain technology has implications for warehouse operations and inventory management because of its advanced data authentication, validation and transparency. Blockchain databases could allow every stakeholder in complex supply chains to connect and share permanent, automated records for every transaction made, with shared data storage accessible to everyone within the secure network.

e. **Warehouse Drones:** Intelligent drone fleets powered by advanced algorithms and connected to cloud-based WMS can help manage inventory inside warehouses. Some warehouse drones are equipped with visual sensors or barcode scanners to track inventory and automate procedures like cycle counting.

f. **Fast Shipping:** The "Amazon effect" of one- or two-day shipping has created intense demand for rapid online shipments regardless of who sells the product. Same-day shipping will continue to drive warehouse automation that speeds up order fulfilment tasks like picking and improves the accuracy and cost-effectiveness of automated packaging and shipping procedures.

g. **Warehouse Cleaning:** There is already a market for automated industrial-sized robotic floor cleaners that navigate complex warehouse layouts. Now, a new class of automated mobile cleaning robots is emerging to safely sanitise and disinfect high-touch indoor workplaces like warehouses and distribution centres with UV lights and sanitising chemicals.

h. **Mobile Shelving:** Amazon is the most famous example of companies using GTP systems powered by AGVs and AGRs. The autonomous robot fleets can load and transport mobile shelving units with stored inventory to designated locations. This enables workers to pick orders with minimal movement and walking time.

i. **Autonomous Vehicles:** Autonomous robotic forklifts are already in use at automated warehouse and distribution centres. Autonomous vehicles are expected to move further up the supply chain to include automated delivery trucks that transport inventory between warehouses, manufacturers and retail locations.



j. **ERP Integrations:** API technology and machine learning (ML) are empowering automation systems that integrate with ERP suites to create an end-to-end automated business platform. Further improvements in automation and ERP applications will free up back-office workforces to perform more value-added, creative and customer-focused tasks.

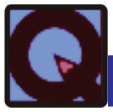
k. **Big Data:** The move toward cloud-based applications and databases capable of collecting, processing and storing large datasets that are easily accessible will drive data analytics around warehouse operations further.

l. **IoT:** Although not strictly an emerging technology, RFID sensors continue to be a driver for new IoT applications that streamline supply chains and warehouse operations. IoT expands warehouse visibility by providing location data on equipment and inventory in real time. The mobility, affordability and real-time inventory tracking capability of RFID sensors provide enhanced data collection capabilities across systems.

m. **Wireless Fleet Management:** Innovations in IoT applications, cloud databases and sensor technology has created the ability to manage automated fleet vehicles wirelessly. Onboard computers communicate telemetry to the system with detailed information about equipment location, maintenance schedules and accident alerts.

### 26.4.1. Cost to Automate Warehouse

The cost of warehouse automation varies depending on the level and type of automation. To determine if warehouse automation is right for business, start by calculating estimated ROI. Estimate the budget for current warehouse labour and existing equipment and include any expected annual increases. Next, calculate average turnover rate for warehouse employees and factor in the cost of hiring and training new employees. Now, determine the purchase cost of the new automated systems and equipment, and factor in estimated labour and cost savings, training and implementation costs and ongoing maintenance expenses. Finally, compare these figures to determine the estimated minimum ROI for warehouse automation.



## INTEXT QUESTION 26.4

1. What do modern warehouses focus on?
2. _____ factor determine the cost of warehouse automation

   a. Estimated ROI  b. Cash flow

   c. Delivery capacity  d. All these

3. What is the role of warehouse drones?

## 26.5. IMPLEMENTING WAREHOUSE AUTOMATION WITH SOFTWARE

Warehouse automation using inventory tracking and warehouse management systems has tremendous potential and will be crucial to the evolution of modern warehouse management. Moving products from one place to another with as little human contact as possible helps create supply chains capable of rapid, seamless order fulfilment. Investing in these machines and advanced devices will help companies continue to meet customer expectations that seem to grow by the day.

### 26.5.1 Barcode systems

A barcode system is a collection of tools that allow for the electronic transfer of data related to inventory's various products. Tools involved in a typical barcode system include:

- Handheld scanners
- Mobile apps
- Web apps
- Printers
- Intranet servers

**A. Laser barcode scanners** are the most well-known type of barcode scanner by today's standards. This type relies on a red diode to read the black and white markings on a label in either a linear or omnidirectional pattern; those that support omnidirectional scanning have a wider reading area, and are therefore easier to use than their linear counterpart.

**B. Linear imaging barcode scanners** only read 1D barcodes. Instead of using a laser, image barcode scanners use image capture technology to scan barcodes and digital image processing functionality to decode them.

**C. 2D barcode scanners** work like linear imagers except that they can read stacked and 2D barcodes. They also scan barcodes in any direction.

### 26.5.2 RFID (radio frequency identification)

Radio Frequency Identification (RFID) is an automated data collection technology that enables equipment to read tags attached to the objects without contact or line of sight. RFID uses radio frequency (RF) waves to transfer data between a reader and an item to identify, track or locate the item. The RFID system consists of a tag, which is made up of a microchip with a coiled antenna, and an interrogator or reader with an antenna. The

reader sends out electromagnetic waves that form a magnetic field when they "couple" with the antenna on the RFID tag. A passive RFID tag draws power from this magnetic field and uses it to power the microchip's circuits. The chip then modulates the waves that the tag sends back to the reader and the reader converts the new waves into digital data and sends them to a server for processing.

In a warehouse when a material is received, the RFID reader can read the contents in the RFID tag attached to the LPN and record a receipt automatically. Similarly, during the outbound shipment process, the RFID reader can read the contents in the RFID tag attached to the LPN and automatically confirm the shipment. This eliminates the task of manual confirmation of receipt and shipment. Using RFID scanning, microchips are placed on or within inventory. These microchips, or tags, include any and all necessary data about the product in question (in a similar fashion to traditional barcodes). That information is then transmitted via radio frequency to an RFID scanning device, allowing warehouse teams to easily keep track of individual products.RFID scanners can scan multiple items simultaneously, in contrast, barcode-tagged items need to be manually scanned one at a time. There are, of course, a few downsides to using RFID:

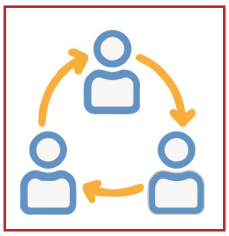
- The need to update scanning equipment throughout warehouse(s)
- The need to maintain the additional data held within the RFID tags
- The monetary and resource-related cost of the above processes

### 26.5.3 ERP Software

ERP (enterprise resource planning software) is a suite of business management solutions with multiple modules to manage every area of the organisation. Most ERP systems include a Warehouse Management System module. The main advantage of using an ERP-based WMS tool is that you'll easily be able to integrate and sync data between *all* tools within the suite. This will ensure that all information presented within any of these platforms is accurate, up to date, and consistent across the board.

Having WMS integrated with ERP system provides additional business benefits that include:

#### Improved Visibility and Collaboration



Having all data and workflows housed and orchestrated in one system that is shared across the organisation increases visibility throughout the company. It also integrates manufacturing and warehouse operations with core business functions like financials, customer service, logistics, and it improves coordination and collaboration.

## Increased Accuracy

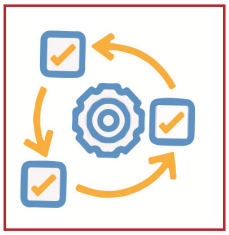
Eliminate manual entry and errors from data having to be re-entered because it is housed in one system of record and source of truth that other business functions and departments can access and share, avoiding the need for redundant data entry.

## Better Decision Making

Real-time information from the warehouse provides insight into what is happening with inventory movement, customer orders, and overall scheduling and planning across the organisation to help make informed decisions.

## Smarter Sales and Customer Service

Provides the sales team with information on what is in stock and the lead times needed. It equips the customer service team with real-time status on customer orders and delivery timing so business can make promises it can deliver upon.



## Greater Agility

With a modern ERP system that is connected across the company, all departments are in sync and it is simpler to adjust business processes as needed when critical information is easily accessed and shared.

## Faster Billing

Having shipment information processed immediately and sent to accounting allows for invoices to be sent quicker and payments to be received faster.

## Track Productivity

With instant notification about where employees are with jobs, managers can ensure things are kept moving and they can track how well staff are performing

### 26.5.4 Electronic Data Transfer

Electronic Data Transfer can significantly reduce the processing time for goods acceptance documentation. Companies that have implemented and integrated EDI in their warehouse business processes realised a reduction in processing time of up to 90%.Moreover, with large volumes of deliveries, there are other advantages of electronic data Interchange. This type of system/approach will be most powerful choice and provides a more complete business management solution that integrates accounting and financials, customer relationship management, inventory management, and more. If you want to better connect all aspects of business, streamline end-to-end processes, and see the benefit of growing and increasing competitiveness with a single solution and source of data, this is a good solution.

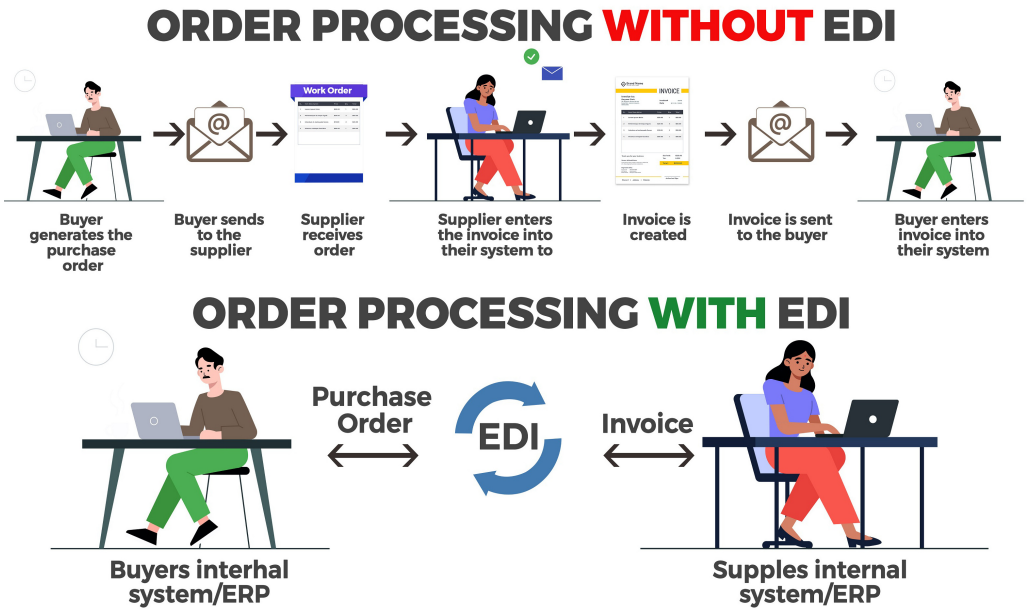



*Fig. 26.4:* **EDI solutions**

The first processes that EDI solutions addressed were the order-to-cash and the procure-to-pay cycles. EDI payment documents and EDI invoices help remove human intervention, thereby reducing errors in these key business documents. EDI transactions now happen automatically—flowing from the accounts receivable systems of the supplier to the accounts payable systems of the buyer in a matter of moments. Where there were errors, these could be quickly identified and addressed. The entire process of an EDI transaction can take minutes or maybe hours compared to days or weeks for the paper-based equivalent.

## Benefits of EDI

**A. Improve customer experience:** Through streamlined orders and purchasing EDI improves order accuracy and transparency, which allows for more increased communication with customers that provides them accurate information on their transactions with the business. This in turn can greatly improve customer experience and loyalty as there's no guesswork or confusion.

**B. Speed Processing:** EDI enables speed and improves overall movement throughout a business because timely processes have become much quicker and streamlined. This can bring about new opportunities for both the business and trading partner as it can introduce opportunities for buyer discounts and innovative finance options of the supplier.

**C. Reduce errors:** EDI standardised transactions with suppliers reducing the risk of miscommunication, human error, incorrect shipments and other mistakes. This can be especially helpful for large retailers as they deal with a large variety of suppliers within their operations.

**D. Save time and money:** Inherent in all of the mentioned benefits is the fact that all of these factors help businesses save time on tedious processes, and save money by moving paper transactions to digital mediums. By switching to EDI in business processes like ordering and purchasing are sped up. Costly expenses for storage are minimised, while costs for communications and manual checks are reduced due to streamlining and improving processes through the EDI system.

**E. Improve inventory management:** EDI documents and transactions both provide a great deal of transparency for businesses and trading partners, allowing for improvements across the board for warehouse management. By exchanging EDI documents, high levels of supply chain visibility provides real-time updates for businesses so inventory levels are much more accurate. This gives businesses the ability to effectively allocate resources and prevent inventory shortages while also giving them the capabilities to eliminate excess inventory.

## INTEXT QUESTIONS 26.5

1. Linear imaging barcode scanners only read _____ barcodes

   a. 1D  b. 2D

   c. 3D  d. All these

2. How EDI improves the efficiency of warehouse

3. Define RFID



## WHAT YOU HAVE LEARNT

| | |
|---|---|
| **Warehouse management system:** | Software designed to manage the movement of inventory to know where final products and goods are at any time to fulfil orders |
| **Warehouse automation** | Process of automating the movement of inventory into, within, and out of warehouses to customers with minimal human assistance |
| **Digital automation** | Uses data and software to reduce manual workflows |
| **Physical automation** | Use technology to minimise employee movement and build more efficient workflows. |
| **Warehouse process automation** | Leads to more cost-effective operations and reduces product handling costs |
| **Barcode system** | Collection of tools that allow for the electronic transfer of data related to inventory's various products |
| **Radio Frequency Identification** | Automated data collection technology that enables equipment to read tags attached to the objects without contact or line of sight. |
| **Enterprise resource planning** | Suite of business management solutions with multiple modules to manage every area of the organisation |
| **Electronic Data Transfer** | Significantly reduce the processing time for goods acceptance documentation |

## KEY WORDS

| | | |
|---|---|---|
| Warehouse management | Warehouse Automation | Digital Automation |
| Physical Automation | Bar code | RFID |
| Scanning Devices | ERP | EDI |

## TERMINAL EXERCISE

1. Define warehouse automation
2. What is digital automation
3. What is physical automation
4. What is robotics
5. Give the types of barcode
6. Explain the block chain technology in warehouse automation
7. List the Tools involved in a typical barcode system
8. Give the major benefits of EDI
9. What are the uses of scanning devices
10. What is wireless fleet management
11. Explain the RFID
12. Discuss the warehouse automation process
13. Discuss the benefits of WMS integrated with ERP
14. Describe the Types of Warehouse Automation Technology
15. Brief about the Categories of Warehouse Automation

## ANSWERS TO INTEXT QUESTIONS

### 26.1

1. A warehouse management system (WMS) is defined as software designed to manage the movement of inventory to know where final products and goods are at any time to fulfil orders.
2. Warehouse automation is the process of automating the movement of inventory into, within, and out of warehouses to customers with minimal human assistance.
3. Choice a.

### 26.2

1. Choice a.
2. An inefficient warehouse negatively impacts the customer experience. Automated warehouses do more with less and thrive under increased customer demand.

### 26.3

1. Benefits of WA - Better resource utilisation, Reduced labour and operational costs and Improved customer service
2. Major challenges areWA requires significant capital to get up and running and expertise to establish and maintain the system, which many companies don't have in-house and can be difficult to find. Additionally, equipment can break down, often at the worst of times, leading to downtime and repair/maintenance costs.
3. Choice a.

### 26.4

1. Modern warehouses focus less on traditional storage roles and more on value-added services, order customization and rapid flow-through processes that stage products according to just-in-time inventory principles.
2. Choice d.
3. Intelligent drone fleets powered by advanced algorithms and connected to cloud-based WMS can help manage inventory inside warehouses.

## 26.5

1. Choice a.
2. Companies that have implemented and integrated EDI in their warehouse business processes realised a reduction in processing time of up to 90%. This provides a more complete business management solution that integrates accounting and financials, customer relationship management, inventory management, and more.
3. Radio Frequency Identification (RFID) is an automated data collection technology that enables equipment to read tags attached to the objects without contact or line of sight.

## DO AND LEARN

Take the examples of agriculture goods and electronic goods that need the warehouse automation process. Make two groups of class and find out how the warehouse operations like physical and digital are performed in the warehouse for the two types of goods selected. Find the difference inefficiency and costs involved

## ROLE PLAY

A warehouse management system (WMS) consists of software and processes that allow organisations to control and administer warehouse operations from the time goods or materials enter a warehouse until they move out. A renowned private retailer Shivaram and a software provider Vivek discuss the warehouse management system using software to fulfil the needs of Shivaram's retail business where he deals with FMCG goods.

Form two groups and initiate the role play of Shivaram and Vivek further to discuss the pros and cons of such a system.

# Senior Secondary

# Transportation and Warehouse Management

## Sample Paper

**Time : 3 Hours** **Maximum Marks: 80**

### Part-A

All question are compulsory select the correct answer our of the given option for question 1 to 40. 1x4=40

1. In India, Roads clutch approximately _____ percent of the country's passenger passage.
   a) 40
   b) 50
   c) 75
   d) 85
2. India's _____ do not have access to all-weather roads.
   a) Towns
   b) Hamlets
   c) Cities
   d) Metropolitan
3. A van or pickup trailer may be used for short places in order to fetch the _____ cargoes.
   a) Odd size
   b) Heavy machinery
   c) light & small
   d) Dangerous
4. The _____has been a major investor in the transport segment in India.
   a) Financial Corporation of India
   b) Indian Financial Corporation
   c) Reserve Bank of India
   d) World Bank

5. The system of packing in _____ transport is less complex.
   a) Road
   b) Rail
   c) Air
   d) Sea
6. As per the statistics, in our Nation, it is understood that there exists only _____ long roads per 100 sq. km area.
   a) 25 km
   b) 34 km
   c) 50 km
   d) 67 km
7. The longest national highway in India is National Highway _____ at 3508 kms.
   a) 2
   b) 44
   c) 63
   d) 102
8. For carrying general haulage _____ type of trucks is most regularly used.
   a) Flatbed
   b) Box truck
   c) curtain sided
   d) tanker carrier
9. When the organization wanted to send large pieces like construction equipment's, building supplies and containers _____ type of road goods consignments are used.
   a) Flatbed
   b) Temperature controlled
   c) car carrier
   d) tanker carrier
10. Car carrying shipments are divided into _____.
   a) Two
   b) Three
   c) Five
   d) Six

11. At present, _____has the majority rapid transit systems in the world.
    a) China
    b) Japan
    c) USA
    d) Australia
12. Most of the _____commuter rail services share their tracks with other passenger and freight trains.
    a) China
    b) British
    c) Japan
    d) Thailand
13. The first monorail prototype was created in the year _____.
    a) 1789
    b) 1820
    c) 1911
    d) 1936
14. The first elevated railway was built in _____ and Greenwich between 1836 and 1838,
    a) New York
    b) Brussels
    c) London
    d) Tokyo
15. _____ is referred as the 'electric street railways'.
    a) Tram
    b) Elevated
    c) Commuter
    d) Monorail
16. _____ are powered by cable traction, and designed exclusively for steep inclines.
    a) Commuter rail
    b) Elevated rail
    c) Street car
    d) Funiculars

17. The fell mountain railway system was designed and developed by a _____ engineer named John Barrowclough Fell.
    a) Japan
    b) French
    c) German
    d) British
18. _____railways are often also referred as 'tourist railroads' and can be seen across the World.
    a) Funiculars
    b) Mountain
    c) Heritage
    d) Tram
19. _____way rail was first introduced by John Curr.
    a) Mountain
    b) Plate way
    c) Elevated
    d) Commuter
20. A rack railway, also referred as a _____ railway,
    a) Street car
    b) Mono
    c) Cog
    d) Heritage
21. Siachen Glacier, is the _____ largest glacier on earth and largest in the Himalayas.
    a) First
    b) Second
    c) Third
    d) Fourth
22. The main Himalayan River systems are the_____.
    a) Godavari
    b) Tapi
    c) Krishna
    d) Ganga

23. The rivers such as the _____ rivers move towards the shallow valleys.

    a) Peninsular

    b) Hindus

    c) Himalaya

    d) Jhelum

24. The origin of Indus is lies in the northern slopes of the Kailash series in _____.

    a) Pakistan

    b) Tibet

    c) Nepal

    d) Bhutan

25. The river Chenab is also referred as _____.

    a) Mahanadi

    b) Narmada

    c) Chandranhaga

    d) Godavari

26. The river Beas is referred as _____.

    a) Bara lacha

    b) Bhaga

    c) Kangra

    d) Kulu

27. The entire length of the river Ravi is stretched with around _____ kms.

    a) 175

    b) 350

    c) 550

    d) 710

28. The Sutlej originates from the _____Lake.

    a) Rakas

    b) Manasarivar

    c) Rupar

    d) Shipki

29. _____ river is called as the Tsangpo in Tibet.

a) Dihang

b) Brahmaputra

c) Kangra

d) Chandra

30. The river Narmada is located in central part of India.

a) East

b) West

c) Central

d) North

31. The Multimodal Transport Act was approved by the Indian Parliament in the year _____ ___.

a) 1971

b) 1987

c) 1993

d) 2002

32. MTO stands for _____

a) Multi Transshipment Order

b) More Than Order

c) Multimodal Transport Operator

d) Moving Through Operator

33. CONCOR was established in the year _____ .

a) 1967

b) 1983

c) 1991

d) 1988

34. DFC's stand for _____.

a) Distance Freight Corridors

b) Dedicated Freight Corridors

c) Dedicated Freight Corridors

d) Dead Freight Corridors

35. The cargoes which are shipped in small vessel are called as _____ vessel.

a) Naval

b) Coastal

c) Mother

d) Feeder

36. The first ISO container was transported towards inland by Railways to the nation's first ICD at _____.

a) Dighi

b) Bangalore

c) New Delhi

d) Guntur

37. Multimodal transport is the shipment of goods under a single agreement, but executed with at least two specific modes of transport.

a) Two

b) Three

c) Three

d) Four

38. Multimodal transportation is also referred as _____transport.

a) Coastal

b) Inland

c) Combined

d) International

39. Co-modal is a _____ term coined by the EU which refers to the utilization of more than one mode of transport to distribute the most sustainable on the whole result.

a) A

b) C

c) D

d) Q

40. _____ in a distribution chain refers to the movement of cargoes from port of origin to destination.

a) De-stuffing

b) Palletization

c) Transportation

d) Warehousing

## Part-B

Answer question 41 to 45 in about 30 to 60 words each 2 x 5 = 10

41. Name 2 basic functions of warehousing.
42. Name 2 abiotic and 2 biotic factors affecting foodgrains in storage.
43. Name 2 key challenges in warehousing sector.
44. What is representative sample.
45. What is the procedure to verify stocks in a warehouse?

## Part-C

Answer question 46 to 50 in about 80 to 100 words each 3x 5 = 15

46. What is standard operating procedure and mention any two benefits?
47. Write a note on Artificial Intelligence, Augmented Reality and chat bots in relation to hospitality sector.
48. Explain Green Logistics
49. Write about National Highways & Wagon Numbering System
50. Elaborate on Hydrogen-powered trains

## Part-D

Answer question 51 to 53 in about 100 to 120 words each 5x 3 = 15

51. Write about inspection and types of audits carried out in warehouses?
52. Bring out the Strategic Objectives of International Civil Aviation Organization.
53. Explain roles & functions of IATA

# Senior Secondary

# Transportation and Warehouse Management

## Marking Scheme

**Maximum Marks** : 80

| Part-A | | | |
|---|---|---|---|
| **Q.No.** | **ANSWER KEY** | **Note** | **Marks** |
| 1 | D | - | 1 |
| 2 | B | - | 1 |
| 3 | C | - | 1 |
| 4 | D | - | 1 |
| 5 | A | - | 1 |
| 6 | B | - | 1 |
| 7 | B | - | 1 |
| 8 | C | - | 1 |
| 9 | A | - | 1 |
| 10 | A | - | 1 |
| 11 | A | - | 1 |
| 12 | B | - | 1 |
| 13 | B | - | 1 |
| 14 | C | - | 1 |
| 15 | A | - | 1 |
| 16 | D | - | 1 |
| 17 | D | - | 1 |

| Q.No. | ANSWER KEY | Note | Marks |
|---|---|---|---|
| 18 | C | - | 1 |
| 19 | B | - | 1 |
| 20 | C | - | 1 |
| 21 | B | - | 1 |
| 22 | D | - | 1 |
| 23 | A | - | 1 |
| 24 | B | - | 1 |
| 25 | C | - | 1 |
| 26 | D | - | 1 |
| 27 | D | - | 1 |
| 28 | A | - | 1 |
| 29 | B | - | 1 |
| 30 | C | - | 1 |
| 31 | C | - | 1 |
| 32 | C | - | 1 |
| 33 | D | - | 1 |
| 34 | B | - | 1 |
| 35 | D | - | 1 |
| 36 | B | - | 1 |
| 37 | A | - | 1 |
| 38 | C | - | 1 |
| 39 | A | - | 1 |
| 40 | C | - | 1 |

## Part - B

| | | | |
|---|---|---|---|
| 41 | • To preserve goods on a large-scale in a systematic manner.<br>• To provides protection to goods against fire, flood, cyclone, storm, heat, moisture, etc. and also minimize post harvest losses. | 1<br>1 | 2 |
| 42 | • Abiotic Factors: Temperature & Moisture content.<br>• Biotic Factors : Insects & Rodents. | 1<br>1 | 2 |
| 43 | • Inadequate infrastructure.<br>• Non availability of land." | 1<br>1 | |
| 44 | Representative samples are made by combining many smaller samples into one larger composite sample. Representative samples are grain samples that accurately represent a specific quantity of grain, such as the contents of an entire grain lot. | 1 x2=2 | 2 |
| 45 | 1. Periodic verification of the stored produce of its recorded quantity in the warehouse and quality is an important procedure for inventory management in the warehouse.<br>Physical verification – Physical count of the units of various commodities as per the warehouse receipts issued is conducted at the prescribed interval to check the accuracy of stock position.<br>Qualitative verification – During the verification of the quality of the stored goods samples are drawn from each stack to check the presence of insect infestation by analysing key parameters like damaged, discolored, weevil led (insect-damaged) or chalky grains in the sample. | 1<br>1 | 2 |
| | **Part - B** | | |
| 46. | SOP is a written document detailing step-by-step instructions to guide the performer of a process or a function or an activity relating to adoption of best practices in performing a specific function in a most optimal way. This document lists all the activities and specifies details like what, why, how, when, where and by whom (commonly called 6 Qs) for execution of the different jobs.<br>1. Well defined steps to perform a work.<br>2. Standardization of activities irrespective of the person performing it.<br>3. Improved safety and security in operation.<br>4. Consistently in the end product. | 1<br>Any 4 point<br>½ x4=2 | 3 |

| | | | |
|---|---|---|---|
| | 5. Easy to train a new employee.<br>6. Sets a standard on expected performance<br>7. Minimizing wastages in processes<br>8. A platform for continuous improvement<br>9. A document to highlight management's standing Court of Law." | | |
| 47 | "Artificial intelligence: It plays a diverse role within the hospitality sector. The AI-powered chat bots are an example of AI, which can be utilized for online consumer interactions, eliminating the lengthy waiting times andoffering swift, bright responses to queries. Still, there are extra benefits is offered to travel andhospitality sectors through artificial intelligence technology. For example, some hotels haveinvented AI and voice-controlled consumer service or tourist data hubs inside their hotels. In themeantime, AI can also be utilized to sort via data, mechanically make alteration to process, andso on.<br><br>Augmented Reality: The augmented reality technology is alike to virtual realitytechnology, but relatively than generating some innovative digital surroundings for users. Further itis concerned with improving the real-world surroundings via graphical or data overlays. Otherthan a Smartphone and an app, unlike the VR technology, it generally needs nothing. This appcan be designed so that consumers can spot their phone at a hotel / restaurant and glance reviews,or opening / closing times<br><br>Chat bots: Chat bots are considered as the major hospitality trends connected with customer service and can be particularly helpful for distributing swift responses to queries, even when staff is not available. In several cases, this can direct to first contact declaration, but the Chabot canalso collect data and pass it on to a human representative if needed." | 1<br><br>1<br><br>1 | 3 |
| 48 | "One of the main trends for future development will be the appearance of Green Logistics. With India focusing on Net Zero emissions across segments, Logistics firms will require to decrease their carbon footprint as well as and grow quickly. Further, the digitization will also assist in several ways. For instance, India has come up with GPS to facilitate the Toll to make sure zero wastage of fuel and resulting emissions among hundreds of Toll Plazas. Current logistics parks are construct with solar made rooftops and sell the carbon-free electricity insteadof consuming it. E-commerce firms have dedicated to distribute 30 per cent of consignments byutilizing Electric Vehicles. India requires a thriving and sufficient logistics segment to attain itsgrowth goal, and digitization is the central to distributing the same." | 3 | 3 |

| | | | |
|---|---|---|---|
| 49 | 1.National Highways:<br>The National Highways are the backbone of the road infrastructure that links every metropolitancities of India such as ports, capital of states etc. It comprises of two, four or more lanesconstructed by charcoal and others by cement concrete. The Ministry of Road Transport andHighways is mainly accountable for development as well as maintenance of National Highways(NHs).<br>2.Wagon Numbering System:<br>In the 2003, IR had adopted a new wagon numberingsystem and these Wagons are allocated 11 digits, making it simple for identification and computerization of a wagons information. The first two digits point out the Type of Wagon, thethird and fourth digits spotlight the owning Railway, the fifth and sixth digits highlights theYear of Manufacture, the seventh to tenth digits specify the Individual Wagon Number, and thefinal digit is a Check digit. | 1<br><br>1 | 3 |
| 50 | Hydrogen-powered trains:<br>The technology powering hydrogen-fueled trains is fairlysimple. The fuel cell is done by an anode, a cathode, and an electrolyte membrane. Hydrogen ispasses via the anode, where it is divide into electrons and protons. Further, the electrons are thenpushed via a circuit that creates an electric charge that is stored in lithium batteries or straightlyutilized by the train's electric motor. The merely waste product created by the trains is donewhen hydrogen molecules respond with oxygen at the cathode and become water. | 3 | 3 |
| | **Part - D** | | |
| 51. | Inspection is basically a system to check compliance to laid down systems and audit is verification of the compliance obligations including inspections.<br>The inspection helps in giving proper recommendations for improvements to comply with standards. The consumer also stands benefitted as they can be assured that the selected goods have been produced as per standards.<br>Audits help in critical examination to manage health, safety and risk management within any organization. It helps the clients for effective management and compliance of different types of risks including legal requirements. The audit follows a systematic approach based on pre decided scope of work. The audit is conducted on specified and identified elements of the quality system as per the checklist prepared by the audit | 1<br>1<br>1 | 5 |

| | | | |
|---|---|---|---|
| | team. Each member of the team is assigned a specific job and duration of time as agreed by both the auditor and auditee.<br><br>Types of audit - Quality system audit and Compliance audit<br><br>i. Quality system audit: This is referred to as a desk audit as it involves mostly a review of the documented quality system against the agreed standards and procedures.<br><br>ii. Compliance audit: It is conducted after a quality system audit has established confirmation to reference standards of the company. This audit deals with the application of the quality system and its verification as described in their system." | 1x2=2 | |
| 52 | "In its continuing mission to support and facilitate a global air shipment structure that meets the social and economic growth and wider connectivity requires of global businesses andpassengers, and admitting the clear requirement to forecast and administer the projected doublingof worldwide air shipment accommodation by 2030 without pointless adverse force on systemsecurity, effectiveness, convenience, ICAO has created five widespread Strategic Objectives:<br><br>1. Safety:<br><br>In order to develop the global civil aviation safety, this objective is focused mostly on the States regulation oversight potential. The Global Aviation Safety Plan (GASP) spotlights themain activities for the triennium.<br><br>2. Air Navigation Capability and Effectiveness:<br><br>Develop the capacity and enhance theefficiency of the worldwide civil aviation system. Even though functionally and organizationallyinter-reliant with Safety, this objective is spotlight on development of air navigation and airportinfrastructure and developing innovative procedures to optimize aviation structure performance. The Global Air Navigation Capability and Effectiveness Plan (Global Plan) sketch the mainactivities for the triennium.<br><br>3. Security &Facilitation:<br><br>In order to increase the global civil aviation security as well asfacilitation, it reflects the requirement for ICAOs leadership in aviation protection, facilitationand associated border security matters. | Any five point<br>1 x 5=5 | 5 |

| | | | |
|---|---|---|---|
| | 4. Economic development of Air shipment:<br>In order to boost the growth of a sound andeconomically pertinent civil aviation system it reflects the requirement for ICAOs leadership inmaintaining the air shipment framework intended on economic guidelines and supportingactivities.<br><br>5. Environmental Protection:<br>In order to reduce the adverse ecological effects of civil aviationactivities it boosts ICAOs leadership in all aviation- connected ecological activities and isreliable with the ICAO and UN structure environmental defence policies and practices." | | |
| 53 | "ROLE AND FUNCTIONS OF IATA<br><br>IATA refers as the International Air Transport Association and is the official trade organisation for the globe's airlines (by admitting more than 85 participating countries).For air carriers, IATA offers a polled resource for scheduling, routing, standardising services and the generation of a international public service for the air segment. For customers, IATA sets the global standard for services and trade practices between member airlines. As an instance, the three-digit airport codes utilised globally are an IATA convention. In addition, IATA aims to attain the subsequent mandate:<br><br>1.To develop safe, regular and economic air shipment<br><br>2.To promote air commerce<br><br>3.To study issues linked with airline industry<br><br>4.To offer a means of collaborating among air shipment companies and agencies<br><br>5.To co-operate with other global air transportation organisations Basically, IATA is airlines working together to regulate and enhance service internationally Owing to the vital position played by IATA in air transportation problems, it is recommended that one should ensure that their carrier/forwarder is an IATA agent.<br><br>IATA is one of the biggest travel and tourism organisations announcing the connection among the airlines all over the globe. The organisation currently has 278 airlines below its wings which represent 117 nations. The IATA members transport around 83% of the total air traffic. The organisation sets guidelines and corporate policies for the airlines and helps airline activities. IATA headquarters in located in Montreal, Canada, and their executive office is situated in Geneva, Switzerland. | 5 | 5 |

Main functions of IATA

i. Safety: The main favourite of the organisation is to make sure the safety of aeroplanes and the air travellers. IATA has set up a board to generate safety standards for the air borne carriers and experts to determine that the guidelines are stringently observed. These attempts by IATA ushered many developments in terms of air travel security and the quantity of air accidents has been extremely reduced.

ii. Security: The airplanes are exposure to terrorism as well as hijack activities. After the increasing amounts of hijack incidents and the September 11 attacks, IATA has taken rigorous standardisation and made necessities to tighten the safety of airlines. The structure works on the basis of passenger segregation and risk evaluation.

iii. Environment: Air shipment contributes to the air pollution in a huge way and it consumes tons of fuel. The introduction of IATA teamed up with aircraft producers to set up energy efficiency with less polluting engines. These attempts were helpful in enhancing the fuel capability to 1.5 per year. The carbon emissions created by aircraft engines were decreased and the organisation is now intended for a 50% decrease in carbon emissions by 2050.

iv. Services: Apart from strategy making and relevant regulatory services, IATA offers several training and advising services. Here are a few services recommended by IATA to enhance the standards of airlines and air travel :

1. The organisation publicises accreditation for travel intermediaries and travel experts, differentiating them from fake travel agencies.
2. The services related to billing and settlement of IATA operate a 300 billion financial structure to verify airline revenue.
3. The ticket tax box service which is a record for airlines to preserve the tax expenditure.
4. IATA determines the course outline and course formation for several travel and tourism courses. The IATA certification assists students to enrol for organisation approved and legitimate courses. All the foremost airlines and travel firms hire the students who possess IATA certifications.