

Module 5: Chapter 3

Techniques of Inventory Control

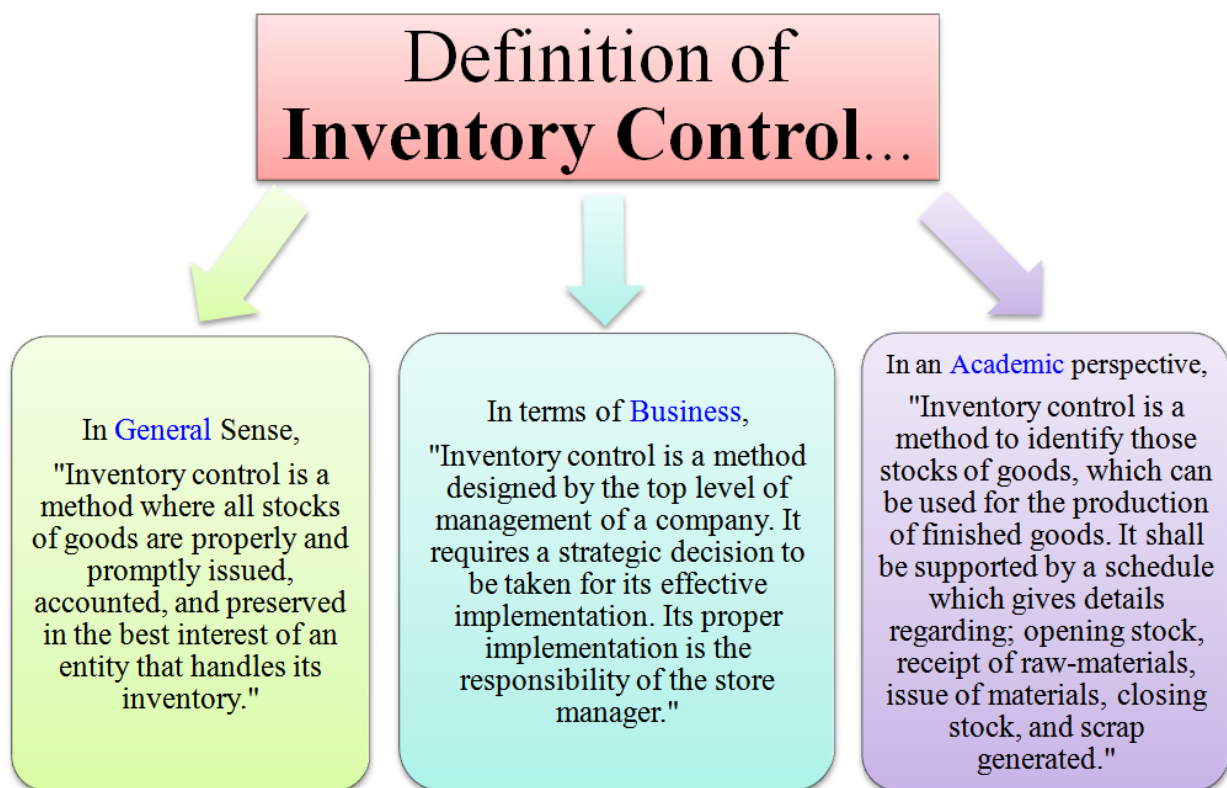


**Indian Association of Preventive and Social Medicine
Gujarat Chapter**

TECHNIQUES OF INVENTORY CONTROL

Learning objectives: At the end of this chapter participants will be able to know:

1. Various inventory control techniques
2. The importance of different inventory control techniques in various situations
3. The pros & cons of various inventory control techniques

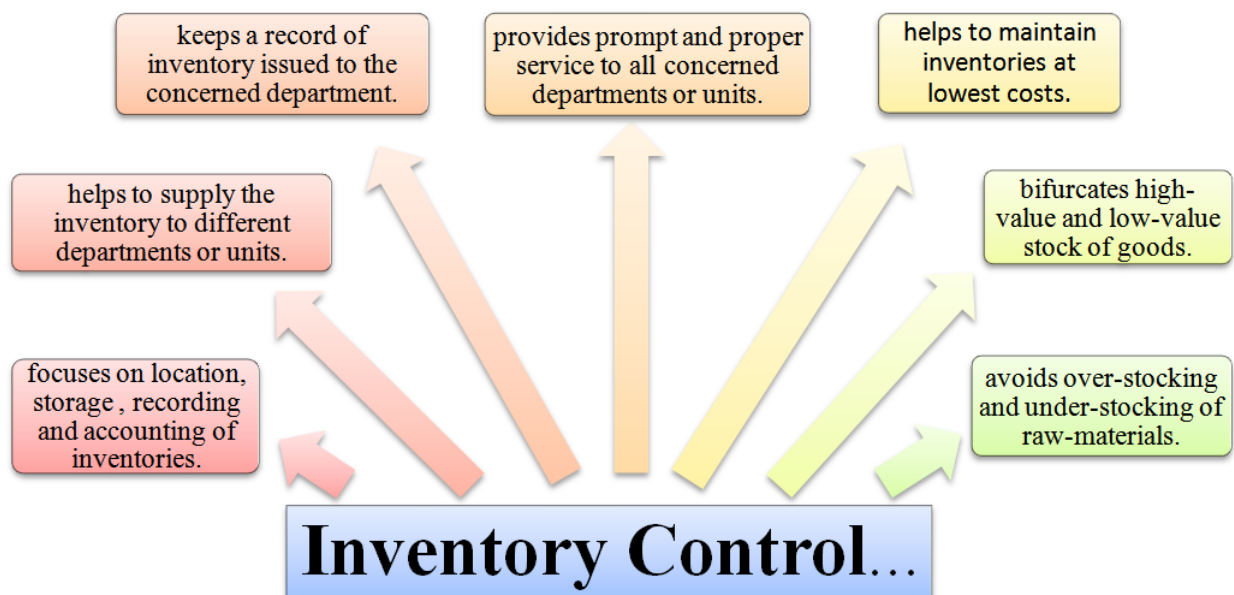


"Inventory Control" focuses on the *process* of movement and accountability of inventory. This consists of *strict policies and processes* in regards to:

1. The physical and systemic movement of materials
2. Physical Inventory and cycle counting
3. Measurement of accuracy and tolerances
4. Good Accounting Practices

"Inventory Management" focuses on inventory as an *asset or an instrument of value creation*. Inventory is managed to maximize value, exposure, and/or profit while minimizing cost and spend. This consists of:

1. Product smoothing and leveraging
2. Selective product placement
3. Velocity and turns calculation development
4. Inventory reduction and product rationalization
5. MRP



- The simple meaning of inventory in dictionary is “detailed list of all the goods in stock.”
- In short, inventory can be defined as the “*a stockpile of goods an organization is offering for sale and components that are used in the manufacturing process.*”

It includes:

- a) Finished goods
 - b) Raw materials (works in process)
 - c) Supplies
- Organizations such as **hospitals** provide the consumer with **finished goods i.e. medicines and drugs**. Inventory is purchased in salable form and used without any further processing.
 - Inventory exists because supply and demand are difficult to synchronize perfectly.
 - Different types of costs are associated with inventory like *item cost, ordering costs, holding cost and stock-out cost*.

Need for inventory control

- Inventories constitute the most significant part of the current assets, representing as much as 50%-70% of the capital investment. Therefore it is absolutely imperative to manage inventories effectively and efficiently in order to avoid unnecessary investment in them.
- If a company's inventory level is too low, it risks delays in fulfilling its customers orders.
If the inventory level is too high, it is using up money that can be better used in other areas. It also risks obsolescence and spoilage.
- *In hospital, about one-third of the annual expenditure budget is spent on buying medicines (Kant S., et al; 1997).* To minimize the inventory investment, the hospital may keep the medicines inventory low, but on the other hand, maximum service to the patients can not be provided and the lack of medicines for patients in critical condition may cause serious problem.

Defining inventory control

- Inventory Control is defined as the supervision of supply, storage and accessibility of items in order to ensure an adequate supply without excessive oversupply.
- *The objective of inventory management is to have the appropriate amounts of materials in the right place, at the right time, and at low cost.*

Strike best balance between 'too much and too little'

ABC ANALYSIS

- ABC analysis is based on **Pareto principle (80-20 rule)** which states that 80% of the overall consumption value (expense) is based only on 20% of the total items.
i.e. small portion of the items may typically represent the bulk of money value, while a relatively large number of items may form a small part of the money value.
- ABC analysis is a method for dividing on-hand inventory into *three classifications A, B, C based on annual consumption unit*.
- **“A” items** : money value is highest **70%**, represent only 10% of items
- **“B” items** : money value is medium **20%**, represent about 20% of items
- **“C” items** : money value is lowest **10%**, represent about 70% of items
- **The following steps along with example will explain to you the classification of items into A, B and C categories**

1. Find out the unit cost and the usage of each material over a given year.

Item #	Annual usage (units)	Unit cost (INR)	Annual Value (INR)
1	17	2.5	
2	50	17	
3	15	15	
4	25	17	
5	5	17	
6	50	119	
7	153	5	
8	20	2.125	
9	16	2.656	
10	17	2.5	

2. Multiply the unit cost by the estimated annual usage to obtain the net annual value.

Item #	Annual usage (units)	Unit cost (INR)	Annual Value (INR)
1	17	2.5	42.5
2	50	17	850
3	15	15	225
4	25	17	425
5	5	17	85
6	50	119	5950
7	153	5	765
8	20	2.125	42.5
9	16	2.656	42.5
10	17	2.5	42.5

3. List out all the items and arrange them in the descending value. (Annual Value)

Item #	Annual Value (INR)	Cumulative Annual Value (INR)	Cum. perc of Annual Value %	Category assigned
6	5950			
2	850			
7	765			
4	425			
3	225			
5	85			
8	42.5			
1	42.5			
10	42.5			
9	42.5			

4. Accumulate annual value and calculate cumulative percentage of annual value.

Item #	Annual Value (INR)	Cumulative Annual Value (INR)	Cum. perc of Annual Value %	Category assigned
6	5950	5950	70	A
2	850	6800	80	B
7	765	7565	89	B
4	425	7990	94	C
3	225	8245	97	C
5	85	8330	98	C
8	42.5	8372.5	98.5	C
1	42.5	8415	99	C
10	42.5	8457.5	99.5	C
9	42.5	8500	100	C

5. Categorization and summary

Category	Item #	% of items in inventory	Total money value	% of total money value
A	6	10%	5950	70
B	2, 7	20%	1615	19
C	1, 3, 4,5,8,9,10	70%	935	11
Total	10	100%	8500	100

☐ **Management policies for ABC categorization :**

- Managing all the inventories in hospital will take personal time and costs money. ABC classification shows that not all the inventories need to be controlled with equal attention.
- ABC analysis for prioritization allows the management to decide which items require most effort in controlling

- **A-items** should have **tight inventory** control under more experienced management. *Re-orders should be more frequent.*
- **B-items** require **medium attention** for control. *An important aspect of class B is the monitoring of potential evolution toward class A or, in the contrary, toward the class C.*
- **C-items** require **minimum attention** and may be kept under simple observation. *Re-ordering is less frequent.*

Class	Degree of control	Types of record	Frequency of review	Safety stock
A	Tight	Accurate and complete	Continuous	Low
B	Moderate	Good	Occasional	Moderate
C	Loose	Simple	Infrequent	large

Let us understand what will happen if items are not categorised as ABC & all stock is ordered once a year or once a quarter same for all items.

Let us assume that all stocks are ordered quarterly as under:

Category	No. Of orders /year	Annual requirement in Rs	Quantity ordered each time in Rs	Average Inventory in Rs (50% of order value)
A	4	40000	10000	5000
B	4	4000	1000	500
C	4	400	100	50
				5550

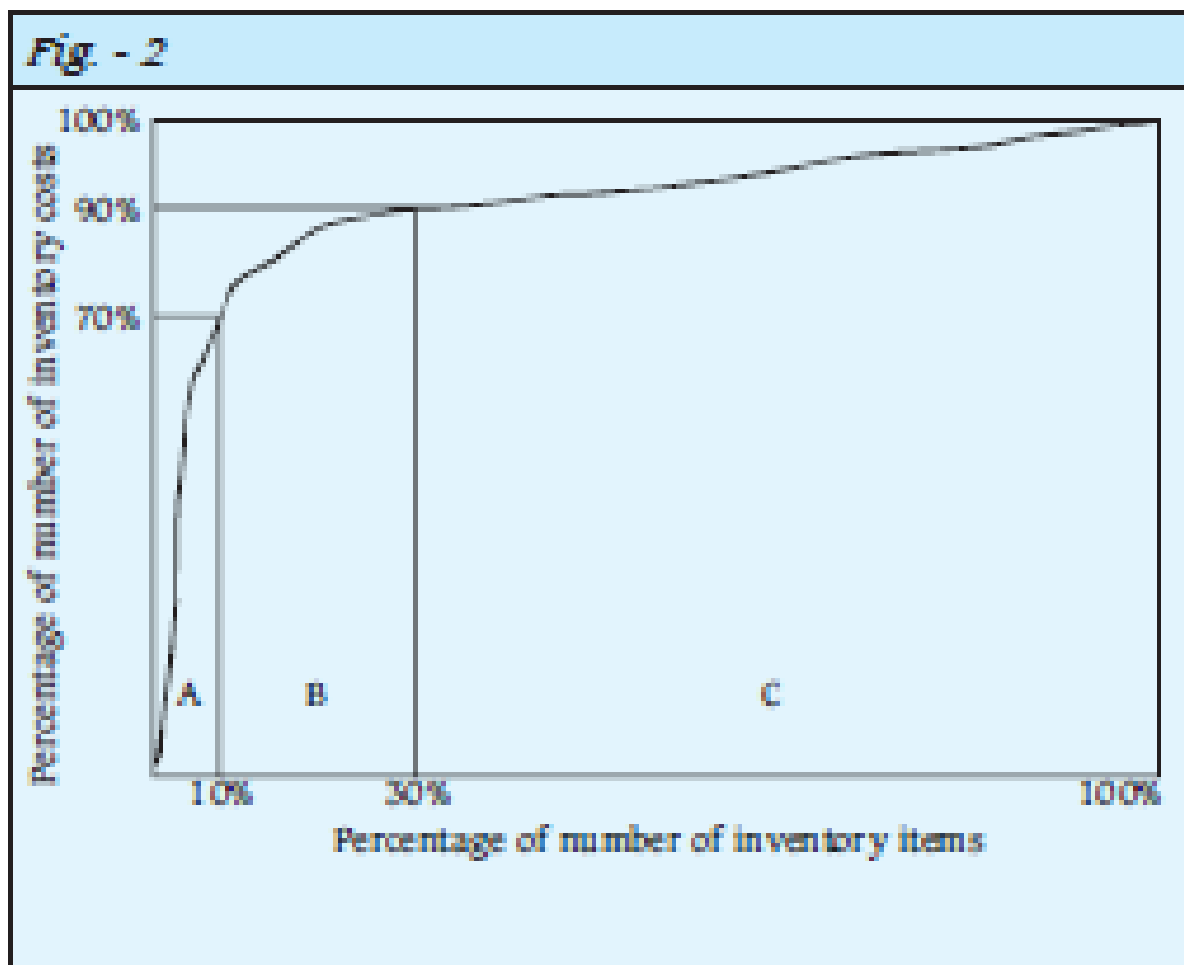
The average total inventory in above case is Rs 5550. Adding 20% of the carrying cost ($555 \times 2 = 1110$), the total inventory cost works out to be $1110 + 5550 = 6660$.

Now if we apply ABC analysis in the above situation

Category	No. Of orders /year	Annual requirement in Rs	Quantity ordered each time in Rs	Average Inventory in Rs (50% of order value)
A	10	40000	4000	2000
B	5	4000	800	400
C	1	400	400	200
				2600

The average total inventory in above case is Rs 2600. Adding 20% of the carrying cost ($2600 \times 20 = 520$), the total inventory cost works out to be $2600 + 520 = 3120$.

Thus by applying ABC analysis we have reduced total inventory cost by Rs 3540 in the above case.



It is thus derived that group A items, which are the costliest should be kept under strict control and should be monitored closely for turnover and expiry. If such costly items accumulate in large quantities in a hospital, they would block scarce finances and lead to high cost of operating the hospital. ABC analysis of inventory leads to certain benefits in form of guidance to the manager about level of control for each type of item, which are summarized in Table below.

Activity	Group A	Group B	Group C
Monitoring	Very Strict	Strict	Moderate
Safety stock to be kept	Low	Medium	high
Level of control for issue	Tight	Moderate	Low
Estimates of requirements	Very accurate	Moderately accurate	May be low
Frequency of purchase	Most frequent	Less frequent	Least frequent
Turnover	Maximum	Medium turnover	Least turnover
Management involvement	Top level	Middle level	Lower level

❑ **Advantages of ABC analysis :**

1. Helps to exercise selective control over such items, which are having a sizable investment.
2. Helps to point out obsolete stocks easily.
3. Provides sound basis for allocation of funds & human resources.
4. It enables the maintenance of high inventory turn over rate.

❑ **Disadvantages of ABC analysis :**

1. Considers only money value of items & neglects the importance of items for the production process or assembly or functioning.
2. It does not categorize the items based on their critical needs, hence sometimes the purpose of ABC categorization may be defeated.

VED ANALYSIS

- **VED (V-Vital, E-Essential, D-Desirable)** classification is based on the **criticality** of the inventories, in contrast to ABC classification which is based on consumption value.
- **Vital (V):** The medicines that are critically needed for the survival of the patients, which ***must be available*** in the hospital all the times. *Vital items (V)* are items like Oxygen which are vital for functioning of a health care establishment and whose shortage will have serious adverse effects on routine functioning of the organisation.
- **Essential (E):** Medicines with lower critical need, which ***may be available*** in the hospital. *Essential items (E)* are the items whose shortage or non- availability can only be afforded for a short time (such as intravenous sets & IV fluids in a hospital) and if their shortage continues for anything more than the shortest time, the functioning would be affected seriously and adversely.
- **Desirable (D):** The remaining medicines with lowest critically, the absence of which will not be detrimental to the health of the patients. These are items whose shortage would not affect the routine functioning of an organisation even if the shortage is for a long time (such as Vit E capsules or sun screen lotions in a hospital's medical store)
- For V items, a large stock of inventory is generally maintained, while for D items, minimum stock is enough
- However if we only consider VED analysis alone, ideal control can be exercised on the vital or essential category.
- But we found that desirable category also contained in class A of ABC classification, hence it was not possible to ignore the desirable category totally.
- **And hence a matrix was formulated by combining ABC and VED analysis which can be used for prioritization, known as ABC-VED matrix.**

ABC-VED Matrix Analysis

- In hospital inventory management, *ABC analysis (based on net value)* should be coupled with *VED analysis (based on the criticality of an item)* to narrow down the group of medicines requiring greater managerial monitoring.

	V	E	D
A	AV	AE	AD
B	BV	BE	BD
C	CV	CE	CD

- Based on ABC-VED matrix, inventories can be categorized into 3 groups.

- Category I :** AV+BV+CV+AE+AD
- Category II :** BE+CE+BD
- Category III :** CD

- Category I** is high priority group, requires greatest attention. The management of class I medicines by top management would help in keeping a check on the annual budget and their availability. It contain all the **vital and costly** items, whose shortage may adversely affect the functioning of the hospital or whose over stocking /pilferage may lead to financial loss to the hospital. These items such as Inj Rabipur, Anti snake venom or costly medicines and vaccines should be monitored by a senior manager himself.
- Category II** is under moderate management and moderate attention is devoted. Here items are **essential but are less costly** and can have lesser stringent controls.
- Category III** is under simple management and receives loose attention. Here *items* are the stores and medicines which are **desirable but would not affect** the functioning of the hospital even if they are not available for a long time. In addition this category would also include least costly medical stores which need not be kept under strict control.

When & How much to order?

- After the inventory has been classified, the two fundamental questions posed to any inventory system are *how much and when to order* ?
- There are 2 (two) inventory system that can be used to answer these questions.
 1. **Fixed order size system**
 2. **Fixed order interval system**

1. **Fixed order size system (Q-system)**

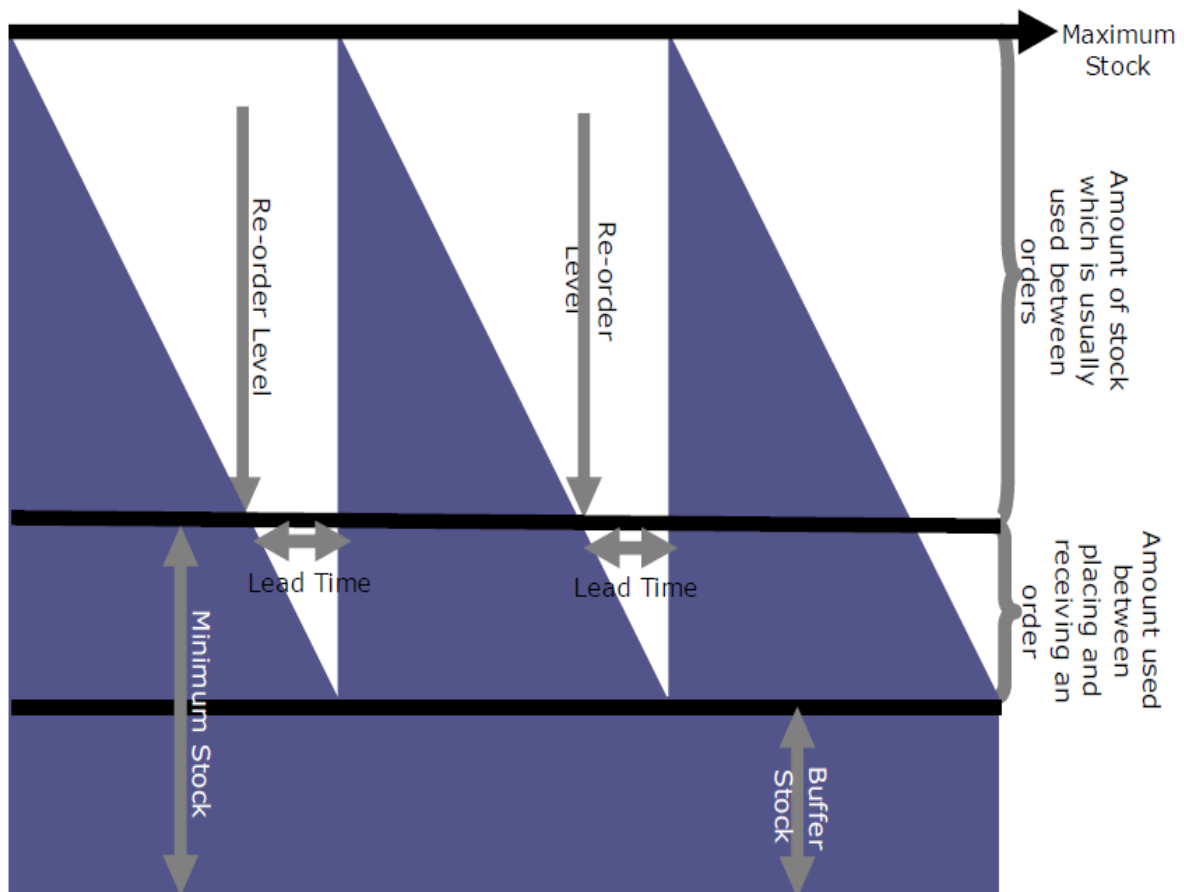
The size of order (Q) is fixed for each replenishment. Time between orders (interval) may vary.

2. **Fixed order interval system (T-system)**

The interval between orders (T) is constant, while size of the order vary depending on the need to reach the maximum stock level.

❖ Example:

- Three most commonly encountered problems in managing logistics of vaccine are **stock-out, inadequate stock and excess stock**.
- These problems can be avoided if a minimum/maximum inventory control system is implemented. This system will ensure that quantity in hand is always between maximum and minimum stock levels.



- For ex; say monthly requirement of DPT vaccine at a PHC is 280 doses and lead time is 1 week.
 - Buffer stock = 70 doses (25% of requirement)
 - Minimum stock (Re-order level) = lead time + buffer stock = 70 + 70 = 140 doses
 - Maximum stock level = minimum stock + stock used between orders (3 weeks stock) = 140 + 210 = 350 doses
- As soon as the stock falls to re-order level, inform the district vaccine stores for replenishment and place and indent to avoid stock-out.