Inventory Control

RN Basu

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DEFINITION

1. Inventory is defined as the sum of the value of raw materials, fuels and lubricants, spare parts, maintenance consumables, semi processed materials and finished goods at any given point of time
2. Inventory control is the process of deciding what and how much of various items are to be kept in stock. It also determines the time and quantity of various items to be procured

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OBJECTIVES

To achieve its objectives, inventory control must:

- determine items to be stocked
- determine when and how much to replenish
- keep suitable records
- weed out obsolete items

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OBJECTIVES (Cotd.)

1. To reduce financial investment in inventories
2. To facilitate Operations
3. To avoid loss from obsolescence
4. To improve customer satisfaction

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NEED

- Inventory control is the scientific method by which an organisation is supplied with the goods and services, that it needs to achieve its objectives at optimum cost
- Without proper control of inventory, serious problems can precipitate, related to patient care, marketing, revenue generation and customer satisfaction.
- In hospital timely availability of drugs and supplies may be affected or if stocked in surplus quantity may result in loss of revenue.

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FACTORS INFLUENCING INVENTORY

- Two fundamental questions:
  - **How much to buy at one time**
  - **When to buy this quantity**
- The answer is governed by:
  - **Requirements : No of expected admissions/ No of operations / procedures / tests to be performed**
  - **Quantity in stock or on order**
  - **Lead time**
  - **Obsolescence:**

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IMPACT ON PROFITABILITY

- Holding inventiories is often very expensive. This has a direct impact on profitability.
- Inventory Turnover : If a hospital keeps one month's consumption, it means inventory turnover is 12 times
- Inventory Turnover rate is closely connected with profitability

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Example – Profitablity and Inventory Turnover

	Hospital A	Hospital B	Hospital C
G. Revenue	1 Crore	1 Crore	1 Crore
G.Profit 12.5%	12.5 Lakh	12.5 Lakh	12.5 Lakh
Materials	50 Lakhs	50 Lakhs	50 Lakhs
Inventories Held Value of Inv	1 Month 4.2 Lakh	6 Month 25 Lakh	12 Month 50 Lakh
Inv. C. C 30%	1.26 Lakh	7.5 Lakh	15 Lakhs
Net Profit	11.24 Lakh	5 Lakh	2.5 Lakh (Loss)

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Cost of Inventory

- Purchasing or Acquisition cost
- Inventory carrying cost
  - Interest on capital, Rentals, Insurance, Obsolescence, Shrinkage, Evaporation, Deterioration or spoilage, Personnel, overheads
- Stock-out cost: when a required material is not available.
  - Tangible and Intangible costs

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What to Stock and How Much to Order

- Inventory control fundamentally consists of finding answers to three questions:
  - Should this item be stocked at all ?
  - If yes, when to order ?
  - How much to order ?
- There should be constant process of review
- The primary consideration for deciding stocking and its level will be availability and delivery time

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How much to be ordered – The Economic Order Quantity

$$Q = \sqrt{\frac{2AP}{UC}}$$

Where

A = Annual Consumption in units
P = Procurement cost per order
C = Inventory carrying cost as a %
U = Unit price

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EOQ ……..

- Some has contended light heartedly that
  - "EOQ is really the
  - Square root of two times a guess, times a scientific guess, divided by a precise guess, times management's guess"
- Nevertheless, the EOQ is still a reasonable choice for estimating order quantities in a perpetual purchasing system

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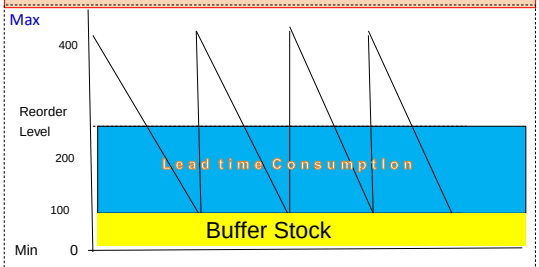
Re-order Level System (Graph)



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RE-ORDER LEVEL SYSTEM

- Not possible to meet minimum quantity for group of items as each item has different reorder quantities
- Perpetual inventory record keeping is very essential with this system
- The system is insensitive to changes in demand and may result in frequency of re-ordering

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Buffer Stock

- Buffer stock or safety stock is required to guard against stock out in case of variation of demand or variation in lead time
- Buffer stock is the idle stock
- It should be kept at an absolute minimum necessary level
- To determine, service level needs to be determined
- Service level means at what percentage of time the requirement of the customer is met

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Calculation of Buffer Stock

- Two scenarios:
  - Demand fluctuation
  - Lead time fluctuation
- For Demand Fluctuation:
  - Say: SD = 48 and Lead time consumption = 500
  - Then Buffer Stock = 48 *√6 = 48* 2.44949 =117
  - For Service Level of 95% = 117*1.64 = 192

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Calculation of Buffer Stock (contd.)

- For Lead Time Fluctuation:
  - Say, lead time varies between 6 Wks to 10 Wks
  - Say, this variation has occurred 25 % of the time (i.e. for 4 weeks)
  - Probability of variation is, therefore, 0.25
  - 4 weeks X 0.25 X 500 (Average consumption)= 500
  - Total safety stock = 192+500 = 692

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Multiplying Factor

Service Level (%)	Service Factor	Service Level(%)	Service Factor	Service Level (%)	Service Factor
50	0.00	84	0.99	94	1.55
55	0.13	85	1.04	95	1.64
60	0.25	86	1.08	96	1.75
65	0.39	87	1.13	97	1.88
70	0.52	88	1.17	98	2.05
75	0.67	89	1.23	99	2.33
80	0.84	90	1.28		
81	0.88	91	1.34		
82	0.92	92	1.41		
83	0.95	93	1.48		

This can also be determined by using NORMSINV function of Excel:
=NORMSINV(Service Level/100)

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Fixed Time System

- Instead of considering the stock level, time is considered
- In the re-order system, the quantity ordered was fixed, in fixed period system it may vary
- Times of replenishment is chosen on administrative convenience

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FIXED TIME SYSTEM

- Inventory costs are not explicitly considered
- Often not possible to meet minimum or package quantity restriction
- The system is OK for recent consumption but is not representative (Recent consumption is random occurrence)
- Frequent reordering of small quantities cannot be avoided when operating this system

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IMPREST STOCK CONTROL

- This is the simplest method
- Involves determination of maximum level
- Bin is topped up as required to maximum level
- Restricted to 'C' or low value items usually
- No need for a reserve quantity

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OPEN ACCESS BIN

- The system is used for low value items
- Workers have free access to the items without any requirement for record keeping
- Imprest stock control can be used with this system
- Quantity replenished is taken as quantity consumed
- Overall control is made at the point from which replenishment is made.

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TWO BIN SYSTEM

- Two bins are kept having different levels
- Second bin is like reserve stock
- When first is exhausted the second is broken into and it is time to replenish the first bin
- Physically two bins can be kept or one bin can be divided into two parts
- No elaborate record keeping necessary.
  - Used for low value items.

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SELECTIVE INVENTORY CONTROL

- A phenomenon – "vital few trivial many"
- This peculiarity is found all around us
- German economist Pareto discovered this
- After his name this is called Pareto Law
- In inventory, 20% contribute to 80 % value
- Primary objective is to reduce cost
- A pertinent way will be to control inventory of high value items
- Cost of control should be less than return from such control
- Answer is selective inventory control

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TYPES OF CONTROL

- Broadly there are eight type of controls
  - A-B-C Always Better Control
  - H-M-L High Medium Low
  - V-E-D Vital Essential Desirable
  - S-D-E Scarce Difficult Easy
  - G-O-L-F Government Ordinary Local Foreign
  - F-S-N Fast Moving Slow Moving Non moving
  - S-O-S Seasonal Off Seasonal
  - X-Y-Z The inventory value of items stored

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ABC Analysis

- Workout annual consumption cost of each item
- Arrange in descending value of their cost
- The cumulative cost is worked out against each
- Mark the figure close to 70% of total exp.
- This will be 10 to 15% of total no of items. This is A category of items
- The next figure to mark is close to 90%. From 'A" to this are "B" category items
- The remaining are 'C" category

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Example

	Items	Annual	Cumulative	Cum. %	Cat.
1	Ampicillin	91000	91000	9.1	
2	Ciproflox	89000	180000	18	
3	Dextrose	83000	263000	26.3	
4	N saline	81000	344000	34.4	
5	Cefataxim	71000	415000	41.4	
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10	Dexona	47000	700000	70	A
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30	Urograffin		900000	90	B
100	Acriflavin	300	1000000	100	C

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V E D Analysis

- ABC analysis is based on monetary value
- An item of low value may be life saving
- VED is based on criticality of the item
- Classified into three categories:
  - Vital
  - Essential
  - Desirable

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Performing VED Analysis

- Should be done by a designated expert committee
- The classification should be determined primarily on the basis of clinical impact of individual medicine
  - Unit prices should be a secondary consideration
  - Popularity of the medicine should have no influence on the process

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ABC & VED Combined

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

- Category 1
- Category 2
- Category 3

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Break Even Analysis

- A decision making tool that enables a manager to determine whether a particular volume of sales will result in losses or profits
- It is a technique widely used by production management and management accountants
- It is based on categorizing production costs between those which are "variable"(costs that change when the production output changes) and those that are "fixed" (costs not directly related to volume of production)

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Break Even Analysis …….

- Fixed costs are those elements that are not directly related to the level of production or output
  - That is, even if the business has zero output, the level of fixed costs will remain broadly the same
- Examples of fixed costs
  - Rent
  - Depreciation
  - Administration costs

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Break Even Analysis …….

- Variable costs
  - These are those costs which vary directly with the level of output
  - They represent payment for output-related inputs
  - Example:
    - Raw material
    - Direct labour
    - Fuel
    - Revenue related cost such as commission

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Break Even Analysis

- Definition
  - An analysis to determine the point at which revenue received equals the cost associated with receiving the revenue
  - Break even analysis calculates what is known as margin of safety
    - At break even point profit and loss are equal
- Formula
  - BEP = FC/(Unit selling Price – Variable Costs)
  - This calculation will let you know how many units of a product you will need to sell to break even

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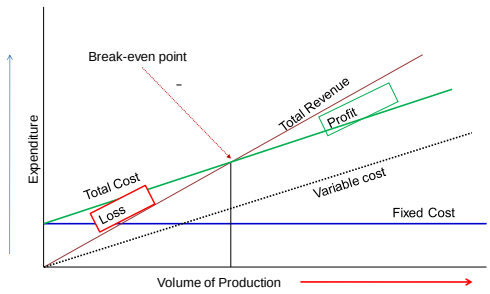
Break-Even Chart



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Example

- Let's say you own a private practice as a doctor
- To examine and prescribe for each patient you spend Rs100.00 as laundry, electricity, stationary, alcohol hand rub etc
- You charge fees to each patient Rs. 500.00
- Your cost for rent, telephone, linen, staff salary and other overhead, etc is Rs. 50,000.00 per month

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How many patients should you see per month to break even?

- BEP = FC/(Unit selling Price – Variable Costs)
- = 50000/(500 – 100)
- = 50000 ÷ 400
- = 125 per month

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