INDUSTRIAL ENGINEERING

Lesson 12
Inventory Management

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Synopsis

This chapter elaborates the concept of inventory, its function and types. Subsequently, the principle of inventory management as well as costs of inventory will be introduced. Finally, the model of economic order quantity and reorder point will be addressed.

Expected Outcome

1. Understand the concept of inventory, its function and types.
2. Describe the inventory management principles.
3. Apply the inventory management principles in managing inventory.

What is Inventory?

Inventory (American English) = Stock (British English).

The goods & materials that a firm holds.

Types of Inventory

Raw material

Work-in-process

Maintenance/ repair /operating (MRO)

Finished goods

Inventory Management

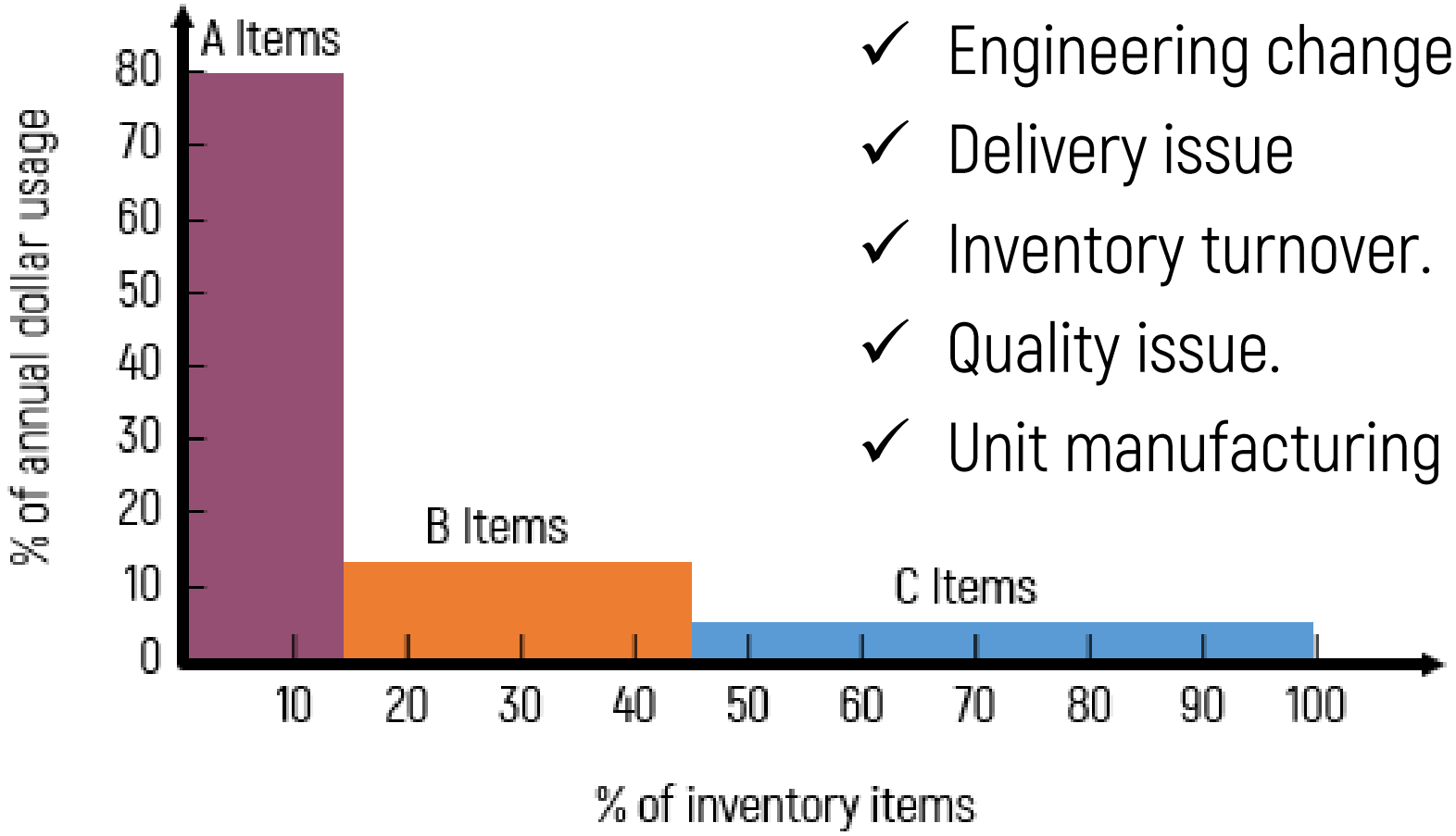
Managing of the order, storage & use of components that a company uses in production & finished products for sale.

ABC Analysis

Divides inventory into 3 classes based on particular criteria (e.g., quantity of item & annual dollar volume).

Class	% Total Items	% Total Dollar Usage
A: Low total item, high annual dollar volume	15%	70% - 80%
B: Medium total item & annual dollar volume	30%	15% - 25%
C: High total item, low annual dollar volume	55%	5%

ABC Analysis



Other criteria may be used in ABC analysis:

- ✓ Engineering changes
- ✓ Delivery issue
- ✓ Inventory turnover.
- ✓ Quality issue.
- ✓ Unit manufacturing cost.

Source: Heizer & Render (2014)

ABC Analysis

Policies employed may include:

- ✓ Focus on developing suppliers for A items.
- ✓ More emphasis to controlling & forecasting A items.

Cycle Counting

Reconciliation actual inventory with inventory records.

Items are counted & records are updated periodically.

Used ABC analysis to determine the counting cycle.

Advantages of Cycle Counting

- Eliminates interruptions of manufacturing process
- Eliminates inventory adjustment
- Identify & correct errors
- Maintains accurate inventory records

Inventory Costs

- Holding/Carrying Costs
- Ordering costs
- Setup costs

Inventory Models for Independent Demand

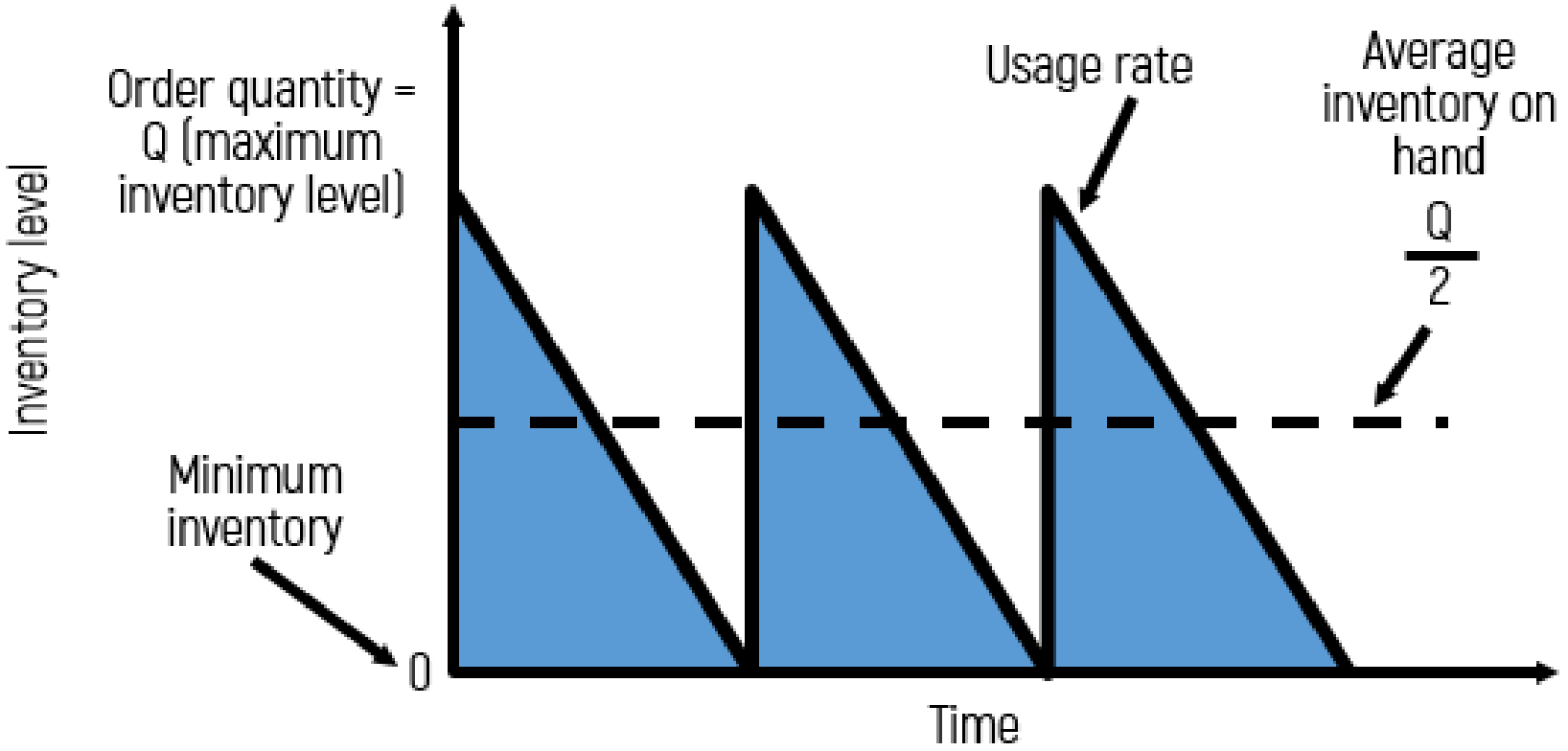
2 important questions:

- ✓ When is the most suitable time to order.
- ✓ How much is the quantity of items to be ordered.

Economic Order Quantity

An inventory management method focusing on minimizing ordering & holding costs.

Inventory Usage Over Time

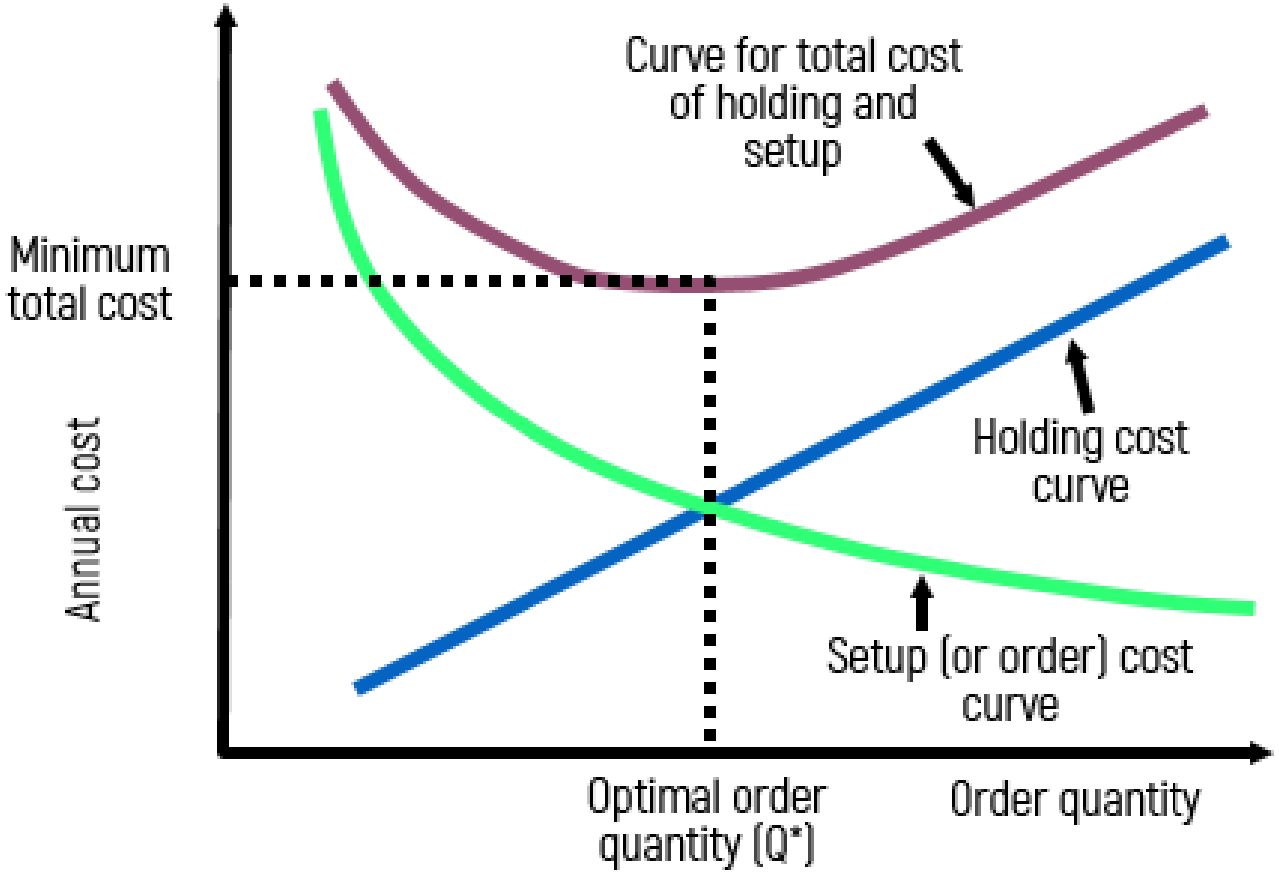


Source: Heizer & Render (2014)

Minimizing Cost

Objective of most inventory model is to minimize total costs.

EOQ (Q*) occurs when total holding costs = total ordering costs.



Source: Heizer & Render (2014)

The EOQ Model

Q = Quantity per order
Q^* = EOQ
D = Annual demand quantity
S = Setup/ordering cost for each order
H = Annual holding cost per unit

$$\text{Annual order cost} = (\text{Number of orders per year}) \times (\text{Ordering cost per order})$$

$$\text{Annual order cost} = \frac{\text{Annual demand}}{\text{Number of units per order}}(\text{Ordering cost per order})$$

$$\text{Annual order cost} = \frac{D}{Q}(S)$$

Source: Heizer & Render (2014)

The EOQ Model

Annual holding cost = (Average inventory level) x (Holding cost per unit per year)

$$\text{Annual holding cost} = \frac{\text{Order quantity}}{2} \text{ x (Holding cost per unit per year)}$$

$$\text{Annual holding cost} = \frac{Q}{2}(H)$$

Source: Heizer & Render (2014)

The EOQ Model

When the EOQ is found?

Ordering cost = Holding cost

$$\frac{D}{Q}S = \frac{Q}{2}H \longrightarrow 2DS = Q^2H$$

$$Q^2 = \frac{2DS}{H} \longrightarrow EOQ = Q^* = \sqrt{\frac{2DS}{H}}$$

Source: Heizer & Render (2014)

Reorder Point

EOQ is about “how much” to order.

The reorder point (ROP) is about when to order.

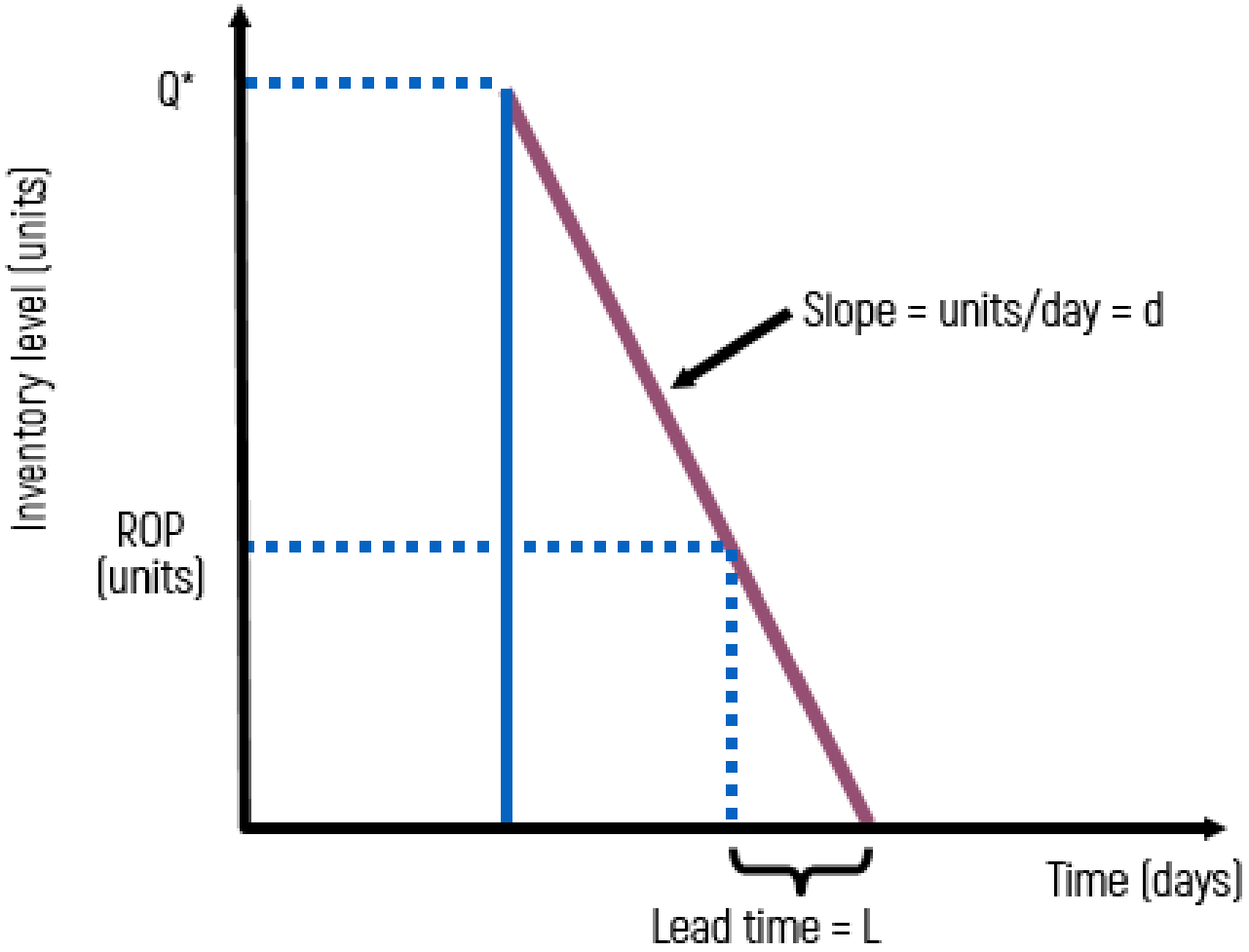
$$\text{ROP} = (\text{Daily Demand}) \times (\text{Lead time in days})$$

$$\text{ROP} = d \times L$$

$$d = \frac{D}{\text{Number of working days per year}}$$

Source: Heizer & Render (2014)

Reorder Point Curve



Source: Heizer & Render (2014)

References

Heizer, J., & Render, B. (2017). *Operations management: Sustainability and Supply Chain Management*, 12th ed. Singapore: Pearson Education, Inc.

Russell, R. S., & Taylor, B. W. (2014). *Operations management and supply chain management*, 8th ed. Singapore: John Willey & Sons, Inc.

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