

FE 422 FOOD PRODUCTION MANAGEMENT

Inventory Management



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Inventory Management

- Inventory means a list compiled for some formal purpose, such as the details of an estate going to probate, or the contents of a house let furnished.
- Inventory management is primarily about specifying the size and placement of stocked goods. Inventory management is required at different locations within a facility or within multiple locations of a supply network to protect the regular and planned course of production against the random disturbance of running out of materials or goods. The scope of inventory management also concerns the fine lines between replenishment lead time, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns and defective goods and demand forecasting.

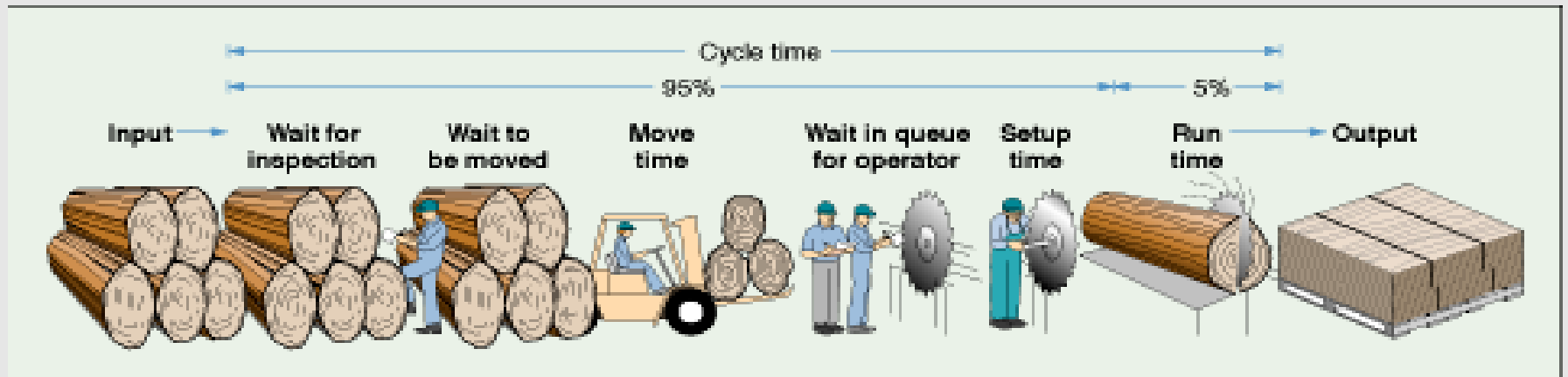
Types of Inventory

- Raw material
- Work-in-progress
- Maintenance/repair/operating supply
- Finished goods

The Functions of Inventory

- To “decouple” or separate various parts of the production process
- To provide a stock of goods that will provide a “selection” for customers
- To take advantage of quantity discounts
- To hedge against inflation and upward price changes

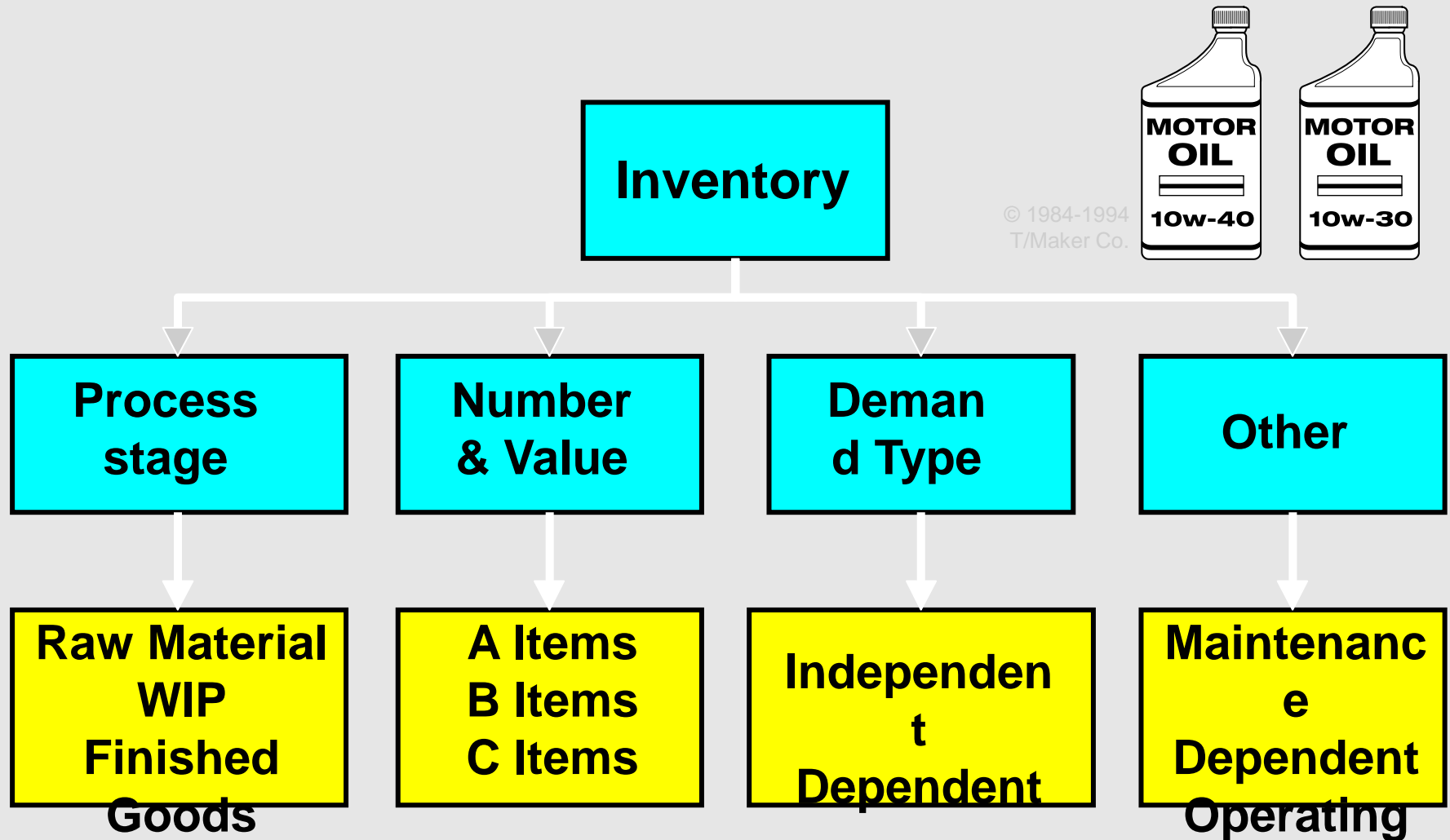
The Material Flow Cycle



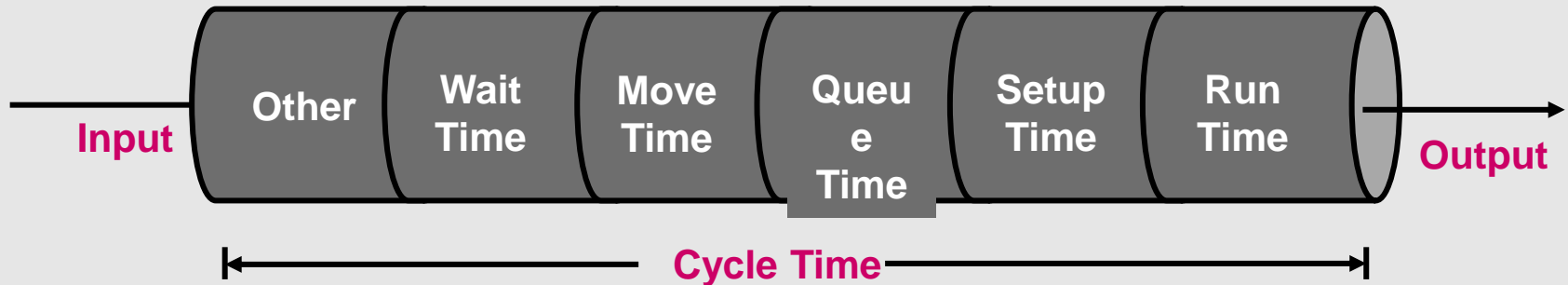
Disadvantages of Inventory

- Higher costs
 - Item cost (if purchased)
 - Ordering (or setup) cost
 - Costs of forms, clerks' wages etc.
 - Holding (or carrying) cost
 - Building lease, insurance, taxes etc.
- Difficult to control
- Hides production problems

Inventory Classifications



The Material Flow Cycle



- 1 *Run time*: Job is at machine and being worked on
- 2 *Setup time*: Job is at the work station, and the work station is being "setup."
- 3 *Queue time*: Job is where it should be, but is not being processed because other work precedes it.
- 4 *Move time*: The time a job spends in transit
- 5 *Wait time*: When one process is finished, but the job is waiting to be moved to the next work area.
- 6 *Other*: "Just-in-case" inventory.

Inventory Costs

- ***Holding costs*** - associated with holding or “carrying” inventory over time
- ***Ordering costs*** - associated with costs of placing order and receiving goods
- ***Setup costs*** - cost to prepare a machine or process for manufacturing an order

Inventory Models

- Fixed order-quantity models
 - Economic order quantity
 - Production order quantity
 - Quantity discount
- Probabilistic models
- Fixed order-period models

**Help answer the
inventory planning
questions!**

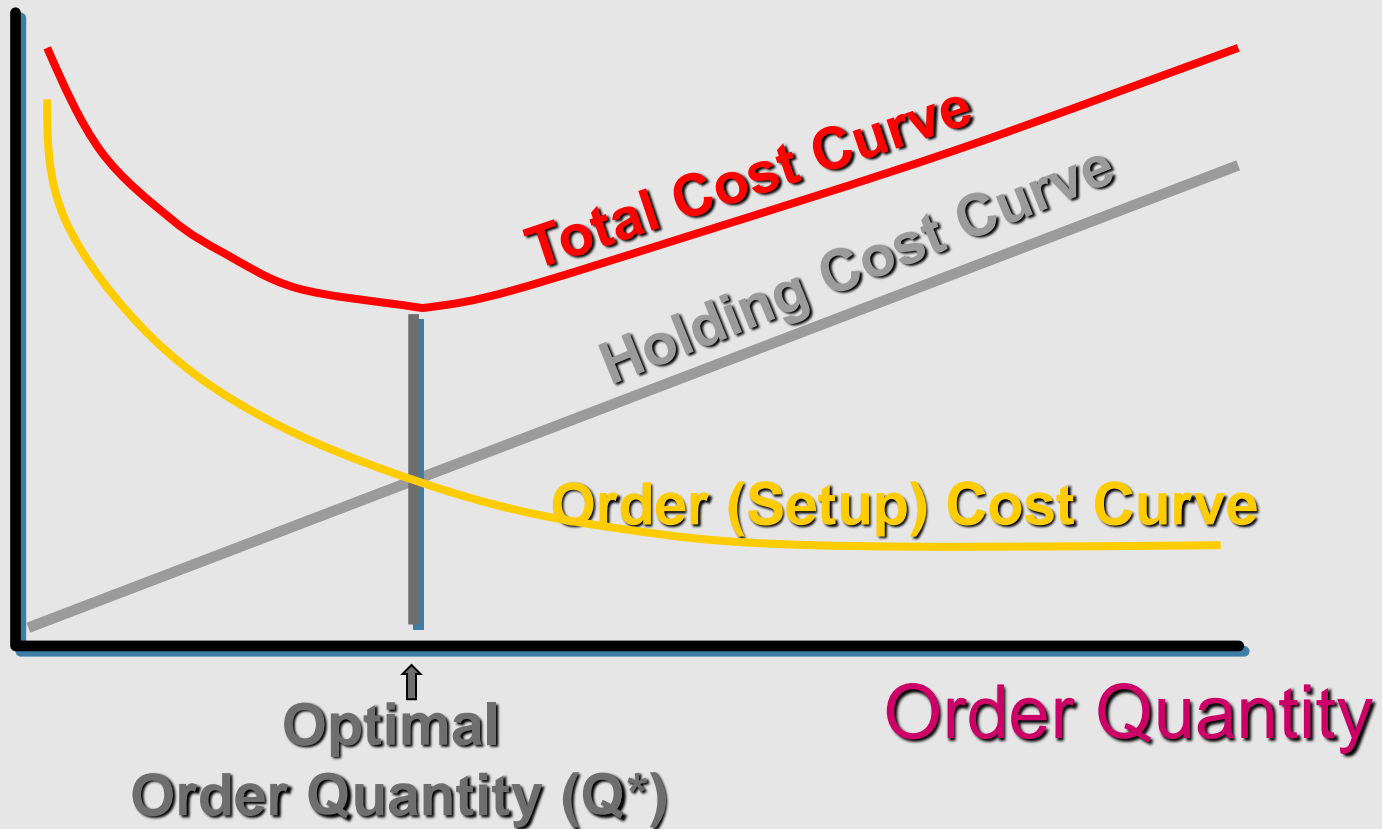
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EOQ Model

How Much to Order?

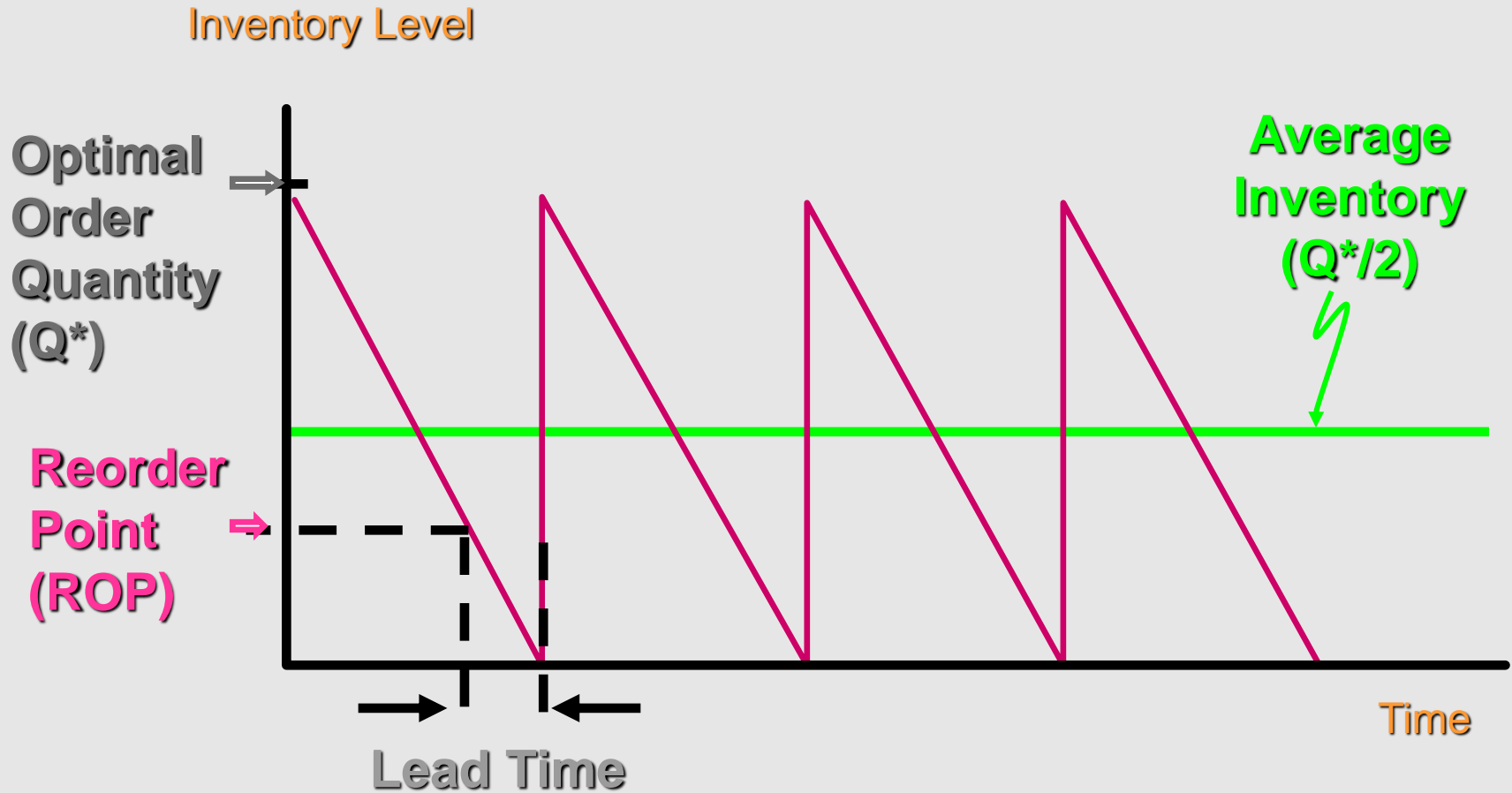
Annual Cost



Deriving an EOQ

- Develop an expression for setup or ordering costs
- Develop an expression for holding cost
- Set setup cost equal to holding cost
- Solve the resulting equation for the best order quantity

EOQ Model When To Order



EOQ Model Equations

$$\text{Optimal Order Quantity} = Q^* = \sqrt{\frac{2 \times D \times S}{H}}$$

$$\text{Expected Number of Orders} = N = \frac{D}{Q^*}$$

$$\text{Expected Time Between Orders} = T = \frac{\text{Working Days / Year}}{N}$$

$$d = \frac{D}{\text{Working Days / Year}}$$

D = Demand per year

S = Setup (order) cost per order

H = Holding (carrying) cost

d = Demand per day

L = Lead time in days

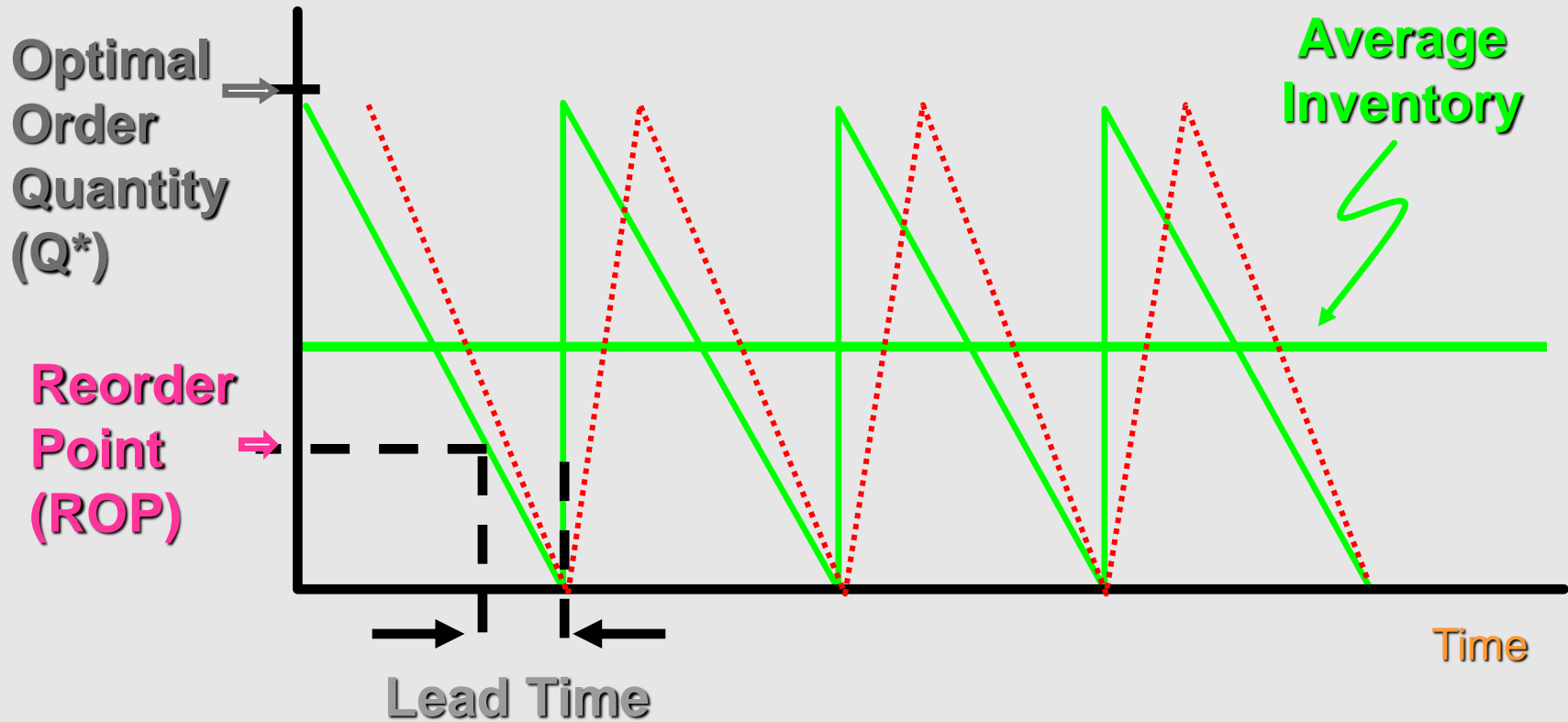
$$ROP = d \times L$$

Production Order Quantity Model

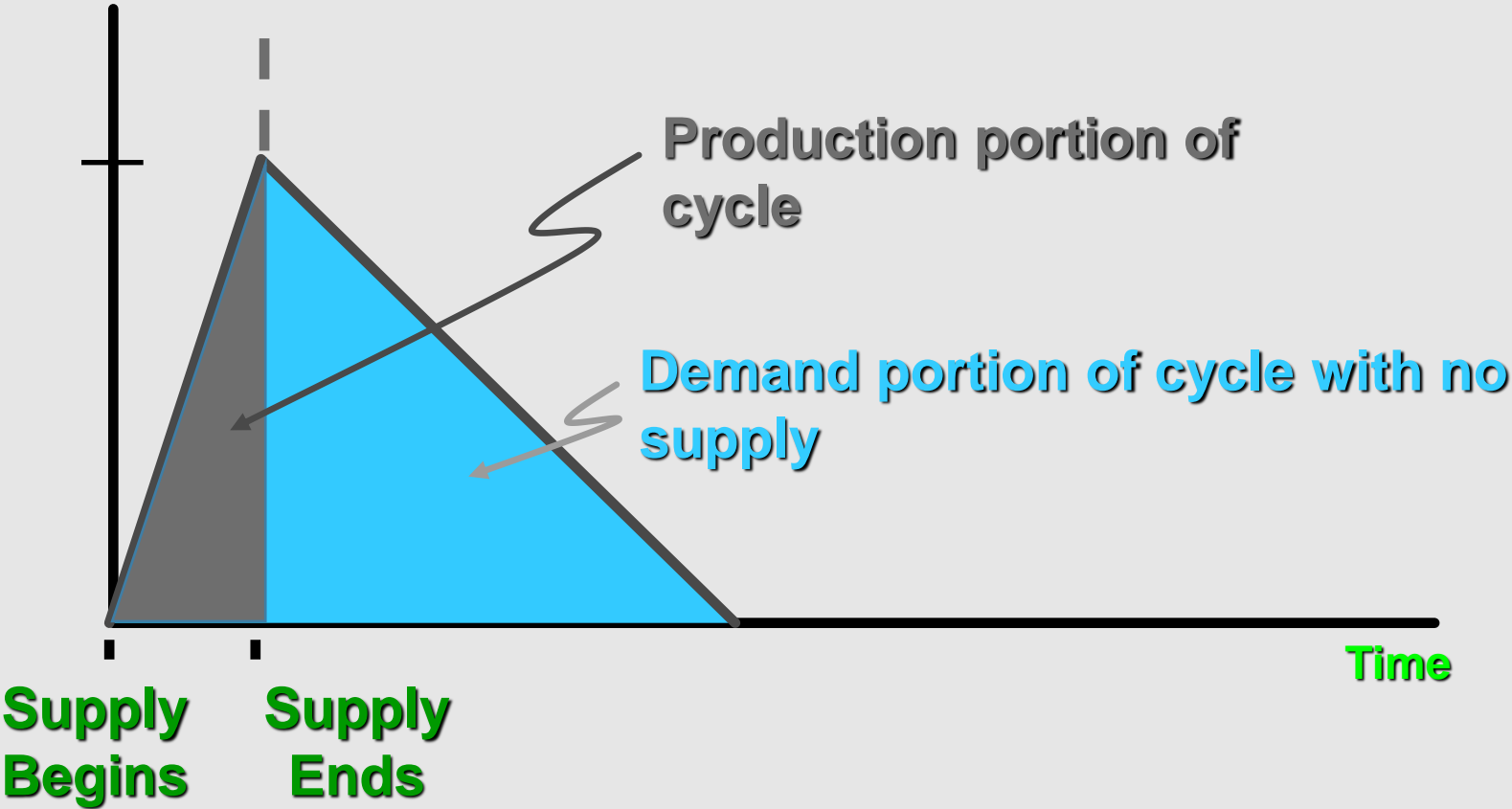
- Answers how much to order and when to order
- Allows partial receipt of material
 - Other EOQ assumptions apply
- Suited for production environment
 - Material produced, used immediately
 - Provides production lot size
- Lower holding cost than EOQ model

EOQ POQ Model When To Order

Inventory Level



Inventory Level



POQ Model Equations

$$\text{Optimal Order Quantity} = Q_p^* = \sqrt{\frac{2 \cdot D \cdot S}{H \cdot \left(1 - \frac{d}{p}\right)}}$$

$$\text{Maximum inventory level} = Q^* \left(1 - \frac{d}{p}\right)$$

$$\text{Setup Cost} = \frac{D}{Q} * S$$

$$\text{Holding Cost} = 0.5 * H * Q \left(1 - \frac{d}{p}\right)$$

D = Demand per year

S = Setup cost

H = Holding cost

d = Demand per day

p = Production per day

Fixed Period Model

- Answers how much to order
- Orders placed at fixed intervals
 - Inventory brought up to target amount
 - Amount ordered varies
- No continuous inventory count
 - Possibility of stockout between intervals
- Useful when vendors visit routinely
 - Example: P&G representative calls every 2 weeks

Fixed Period Model When to Order?

Inventory Level

Target maximum

