

CHAPTER 14:

Material Requirements Planning (MRP)



*Material Requirements
Planning (MRP)*



Introduction

MRP (Material Requirements Planning)

- Planning & scheduling technique used for batch production of assembled items

ERP (Enterprise Resource Planning)

- Integrated database software systems to integrate all activities within a firm. Examples: SAP, JD Edwards, Baan
- Majority of large manufacturing firms use ERP

Dependent vs. Independent Demand

Dependent demand:

- Demand for materials which are derived from the build-plan of finished goods. Example: Wagon handle, body & wheels

Independent demand:

- Demand for the finished goods we sell to customers. Example: Wagon Model#12

MRP

Independent demand:

- Red Wagon Model #12



Dependent demand:

- The parts needed to make the wagon

Handle – 1

Body – 1

Wheels – 4

MRP

Build 100 wagons in May

How many parts do I need?

Handle 1 x 100 = 100

Body 1 x 100 = 100

Wheels 4 x 100 = 400

Do I have any parts in my warehouse now?

Do I have any parts already ordered



MRP



Part	MPS Req'd.	On-hand	Buy
Handle	100	50	50
Body	100	0	100
Wheels	400	200	200

Part	MPS Req'd.	On-hand	On -order	Buy
Handle	100	50	25	25
Body	100	0	50	50
Wheels	400	200	100	100

MRP

Build 100 wagons in May

What if the supplier only sells wheels in cases of 500 pieces?

What if my on-hand inventory of handles is in error – short by one piece

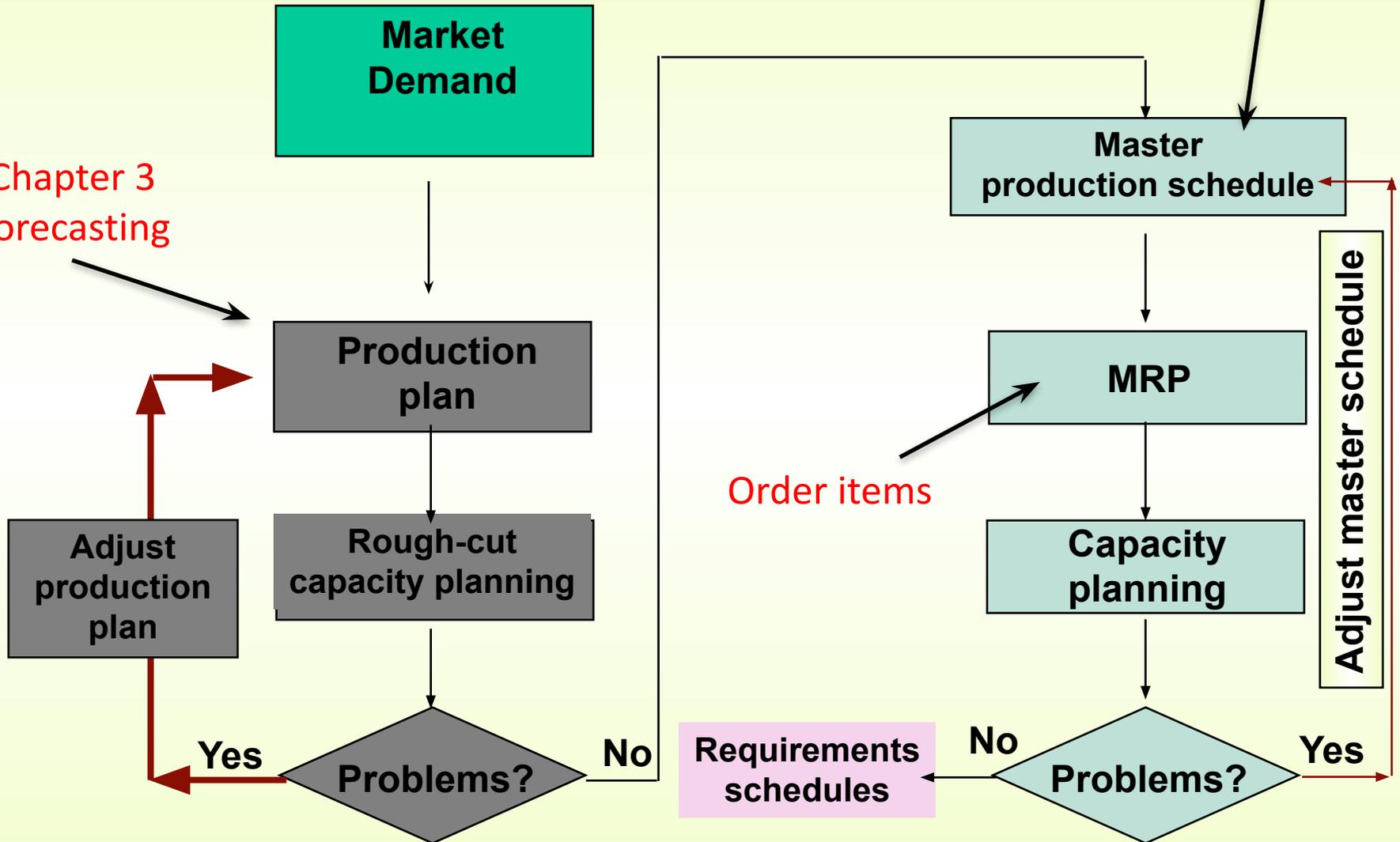
Factor in **Lead Times** – time for supplier to make items and ship to your factory



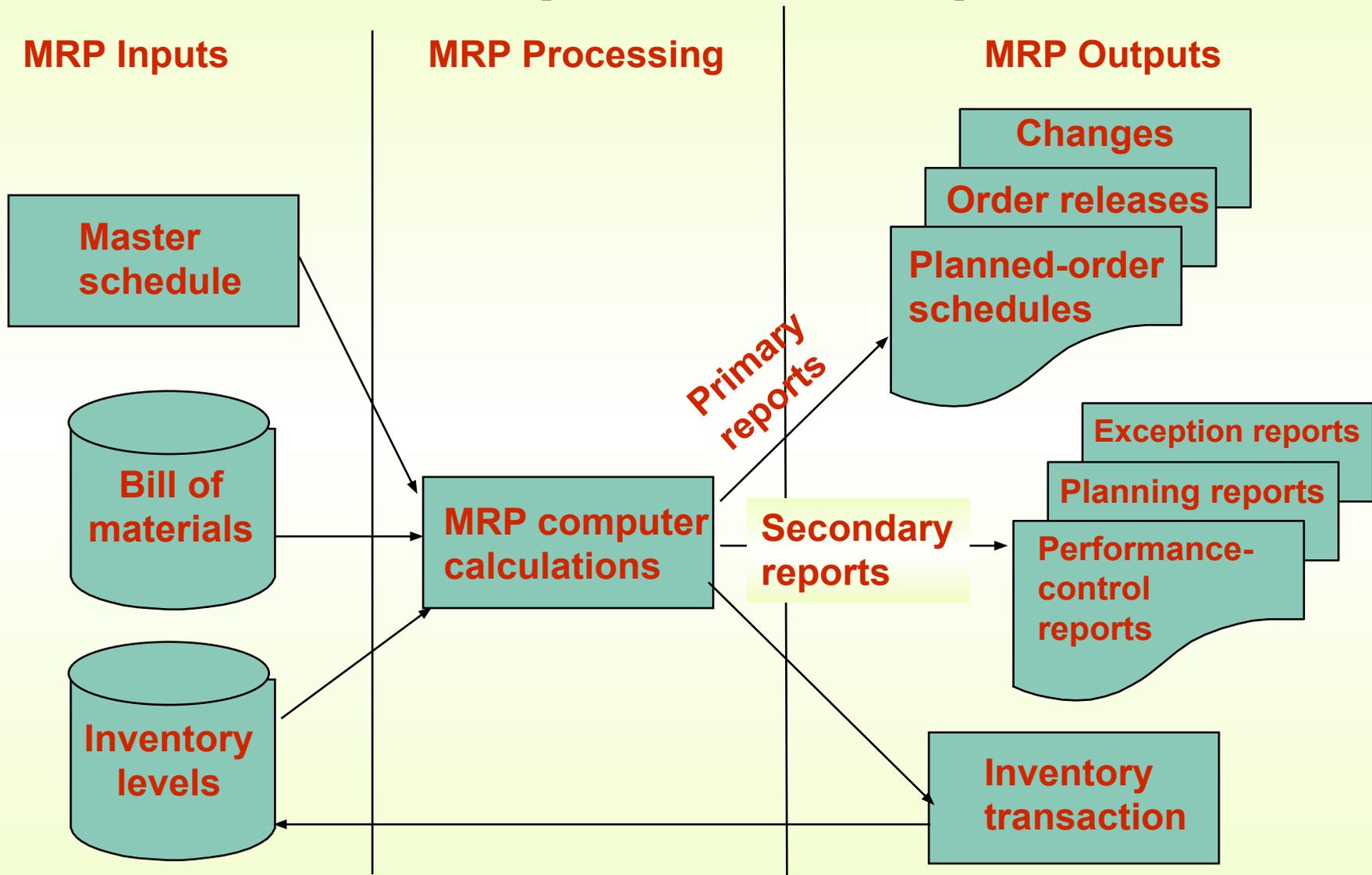
MRP

Build 100 red wagons

Chapter 3
Forecasting



MRP Inputs and Outputs



MRP Inputs

Master Production Schedule

- Build plan for Finished Goods to be produced, when these are needed, and in what quantities

Bill of Material (BOM)

- BOM - A listing of all materials needed to produce one unit of a product
- **Job Routing** – work centers to be used, activities to be performed and the standard time per activity (in minutes)

Inventory levels, ordering lead times, and open orders
(in-transit purchase orders)

MRP Outputs

Actions

- Specific actions to create suggested production runs and inventory requirements

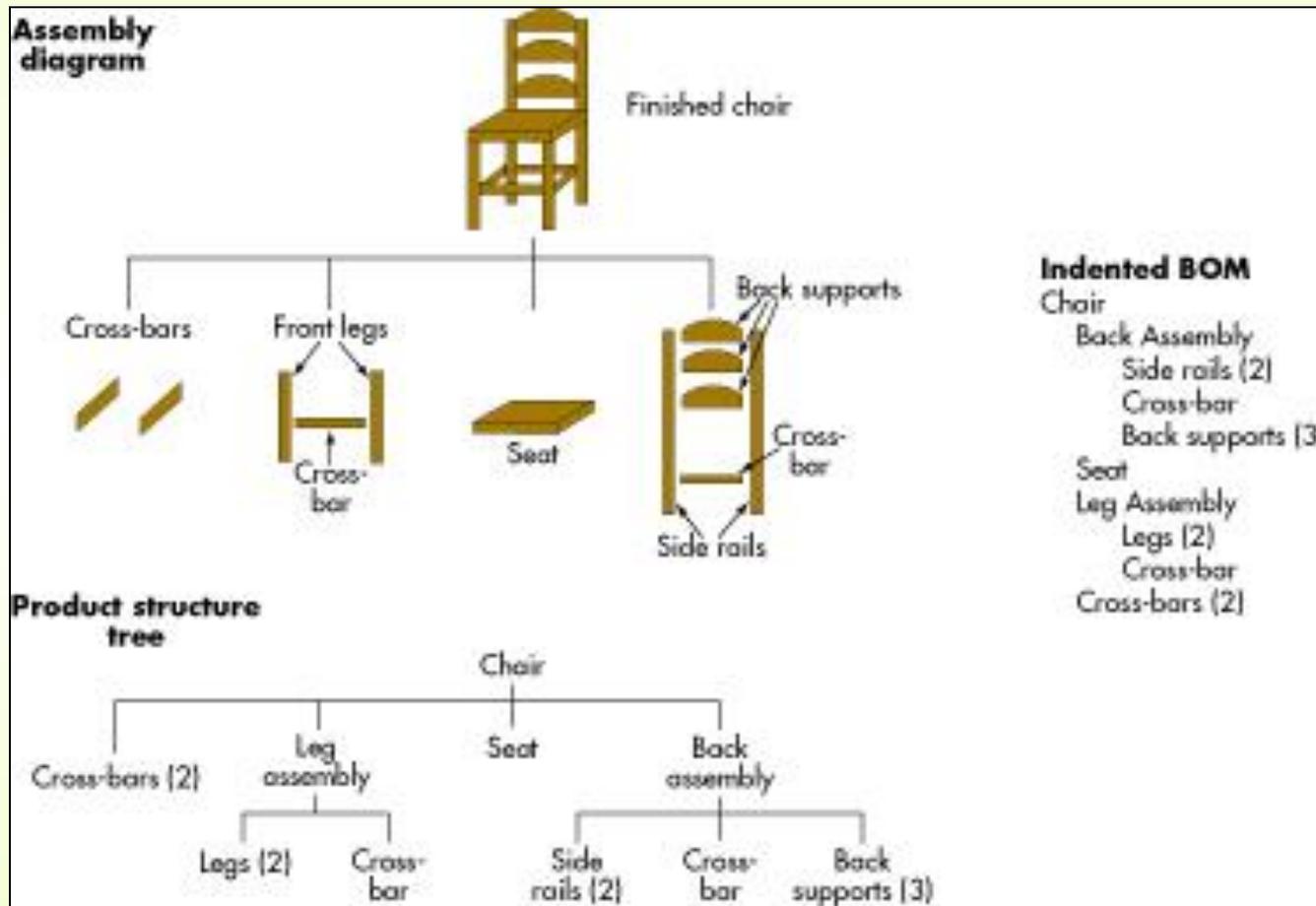
Reports

- Purchasing – what items need to be purchased from suppliers
- Production – what items do we need to build, in what quantities and when

Inventory transactions

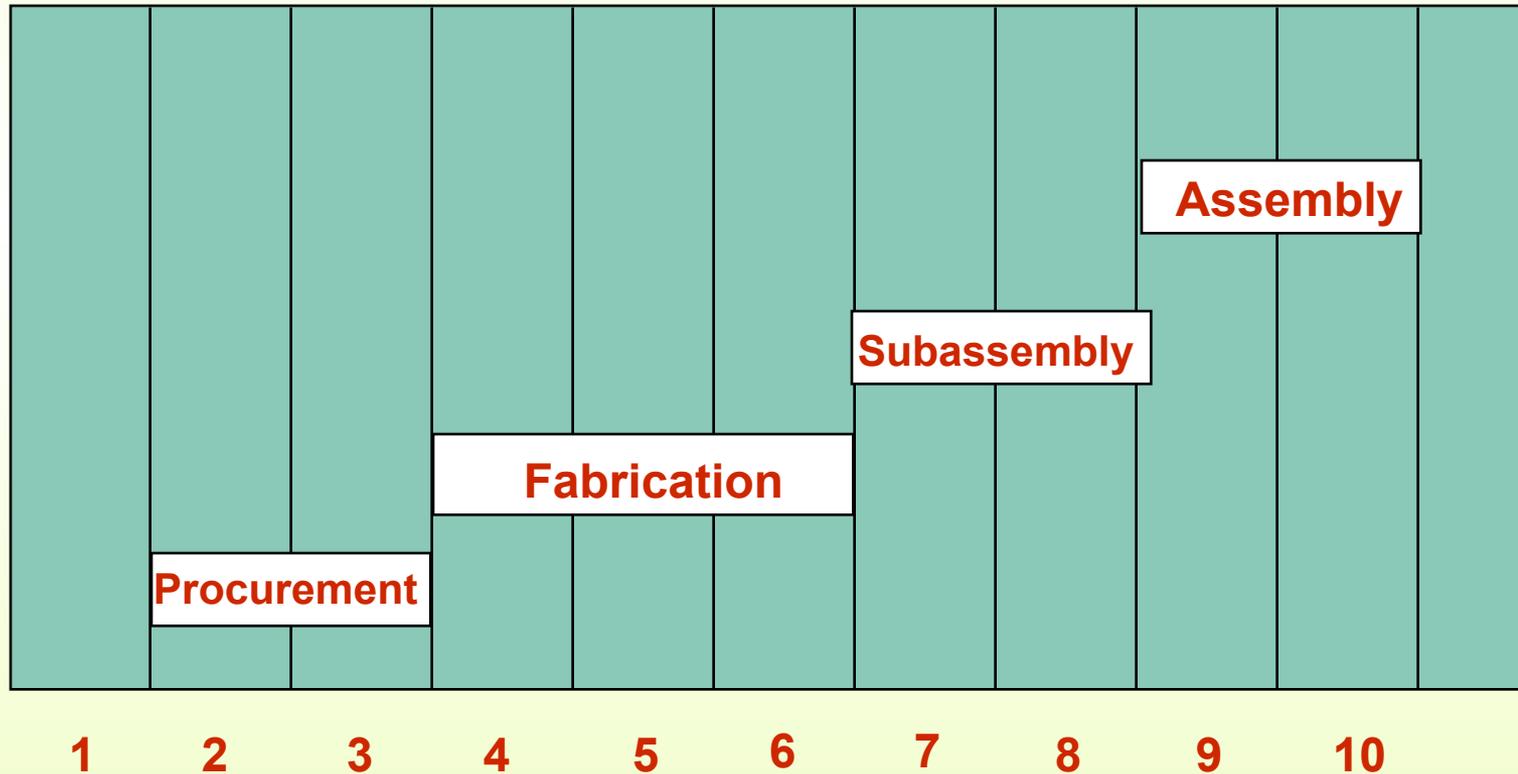
- Adjusting computer inventory levels as items are received, used and sold

Assembly Diagram & Bill of Material



MRP Calculations – Lead Times

MRP processing takes the end item requirements specified by build plan (MPS) and explodes them into time-phased requirements for manufacturing of subassemblies



Net Requirements

$$\left(\begin{array}{c} \text{Net Requirements} \\ \text{in period } t \end{array} \right) = \left(\begin{array}{c} \text{Gross Requirements} \\ \text{in period } t \end{array} \right) - \left(\begin{array}{c} \text{Projected Inventory} \\ \text{at the start of period } t \end{array} \right) - \left(\begin{array}{c} \text{Scheduled} \\ \text{receipts} \end{array} \right) + \left(\begin{array}{c} \text{Safety} \\ \text{Stock} \end{array} \right)$$

Gross requirements

- Total expected demand for an item in a time period

Scheduled receipts

- Open production orders not yet finished (work in process)

Projected on hand

- Expected amount of inventory that will be on hand at the beginning of a time period

Net requirements

- The actual amount needed in a time period – report is generated to Purchasing Department to buy these items and quantities

Net Requirements

Planned order receipts

- Quantity expected to be received in the beginning of a time period – production orders that will be finished

Planned order releases

- Planned amount to start being built in a time period, but due to lead time may finish in a later period

Pegging

- The process of identifying the parent items that have generated a given set of material requirements for an item – useful if we have shortages of a raw material

Updating the System

Typically each evening after shut-down, ERP will process pre-assigned routine “jobs” one of which is MRP updating

Regenerative System

- Recalculates ALL items in MRP – lengthy process

Net Change System

- Updates only those items that their status or quantities have changed since last MRP calculations

Nervousness

- Reacting constantly, making frequent changes , perhaps every day– **how does this impact operations?**

Other Considerations

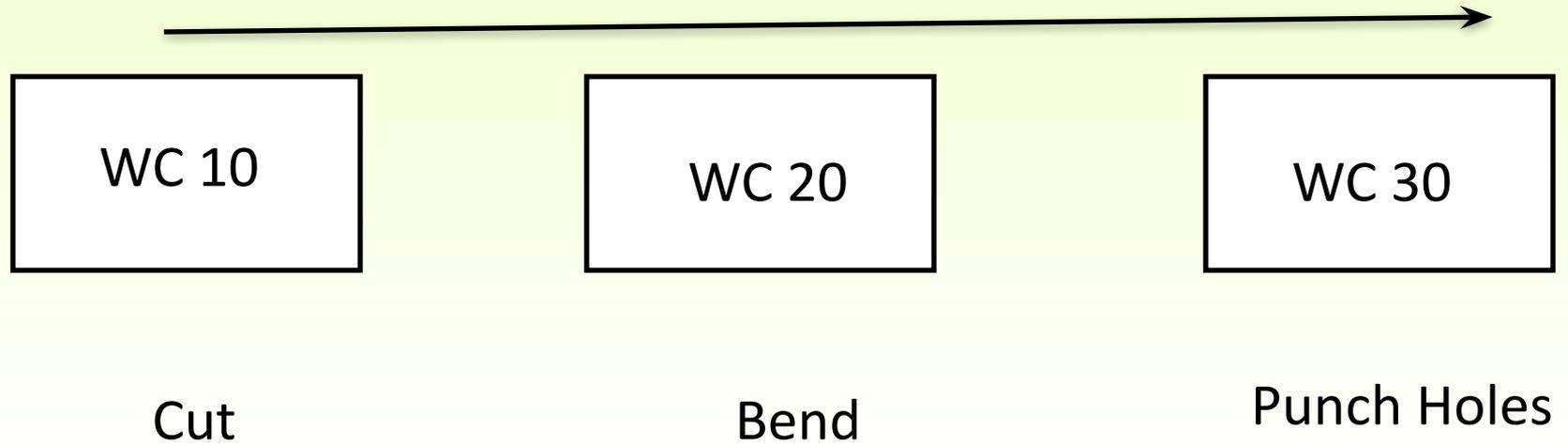
Safety Stock

- For or operations that are subject to variability in time (not consistent)
- Determine the average level of variability and stock inventory to cover this period

Lot sizing: choosing a lot size for ordering or production

- Lot-for-lot ordering - Need 5 order 5
- Fixed-period ordering - Once per week
- Fixed- quantity – Dozen eggs

Job Routings



For each product create job routing steps

Can track capacity load by work center – how many orders
in any week – total % example 89%

Capacity Requirement Planning

Capacity Requirements Planning:

- The process of determining short-range capacity requirements (daily or weekly) – by work center

Load Reports:

- Work center reports that show current and upcoming capacity requirements (amount of work to do, expressed in hours) per day or per week