Overview

- Dependent demand
- Master production schedule
- Bill of materials
- MRP
  - Time-phased product structure
  - Gross material requirements plan
  - Net requirements plan
- Lot-sizing techniques
- Extensions of MRP

Furniture Mfg.

- Produces 3-types of chairs
  - Ladder-back chair
  - Kitchen chair
  - Desk chair

Master Production Schedule

<table>
<thead>
<tr>
<th></th>
<th>April</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ladder-back chair</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kitchen chair</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Desk chair</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Aggregate</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>production plan</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>for chair family</td>
<td>670</td>
<td>670</td>
</tr>
</tbody>
</table>

Bill of Materials

- List of components & quantities needed to make product
- Provides product structure (tree)
  - Parents: Items above given level
  - Children: Items below given level
Chapter 14 MRP

Bill of Materials

Dependent vs. Independent Demand

- Demand for chairs
  - A finished product
  - **Independent**

- Demand for front legs
  - A component or subassembly
  - **Depends** on the demand for chairs (parent)

Requirements for Effective Use of Dependent Demand Inventory Models

- master production schedule
- specifications or bills-of-material
- inventory availability
- purchase orders outstanding
- lead times

Cooperstown Cars, Inc.

- Produces toy cars
  - Body
  - Axles (2)
  - Wheels (4)

Cooperstown Cars, Inc.

- Demand for Toy Car in Week 8 is 100

  - Schedule production for:
    - Toy car assembly
    - Wheel assembly
    - Body
    - Axle
    - Wheels
Lot-Sizing Rules

When there is a net requirement, how much should we order?

• Lot-for-lot – L4L
• Economic Order Quantity – EOQ
• Part Period Balancing - PPB
• Wagner-Whitin Algorithm
**Lot-Sizing Rules: L4L**

<table>
<thead>
<tr>
<th>Net Requirements Plan</th>
<th>Week</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wheels</strong></td>
<td>1</td>
</tr>
<tr>
<td>Gross requirements</td>
<td>150</td>
</tr>
<tr>
<td>Scheduled receipts</td>
<td>200</td>
</tr>
<tr>
<td>Projected on-hand</td>
<td>30</td>
</tr>
<tr>
<td>Planned order receipts</td>
<td>150</td>
</tr>
<tr>
<td>Planned order releases</td>
<td>150</td>
</tr>
</tbody>
</table>

**Lot-Sizing Rules: EOQ**

\[
Q^* = \sqrt{\frac{2DS}{H}} = \sqrt{\frac{2 \times 100 \times 5}{368}} = 116
\]

\[
S < 3100 \quad H < 31 \text{unit/week} < 352 \text{unit/year}
\]

\[
D = [150, 120, 150, 120] \quad h = 0.5 \text{unit/week} \quad s = 35 \text{unit/week}
\]

**MRP II**

- Customer orders
- Forecasts
- Master production schedule
- Bills of materials
- Routings
- Time standards
- Inventory records
- Inventory transactions
- Material requirements plan
- Manufacturing resource plan
- Cost and financial data
- Purchasing reports
- Financial accounting reports
- Sales and marketing reports
- Human resource reports
- Manufacturing reports

**Extensions to MRP**

Enterprise Resource Planning

MRP II with ties to customers and suppliers

**ERP @ BMW, Spartanburg**
Product

- BMW X5 sport activity vehicle
- Application: mySAP™ Automotive
- Goal:
  - Tight supplier network in order to ensure just-in-time production
  - Compress Customer Order Cycle
  - Improve Inventory Accuracy

Why use ERP

- Automotive Industry is competitive
- Global competition
- Trend toward make-to-order manufacturing -- filling individual customer requirements rather than make-to-stock \( \rightarrow \) new demands on manufacturers and dealers
- Potential cost reduction
- Customers want what they want, when they want it.

Key success factors in the Automotive Industry

- Speed: speed in product development, speed in product assembly, and speed in product delivery to dealers and customers.
- Manufacturers must closely manage armies of suppliers and partners to make certain that the correct systems and components are delivered where and when they are needed.
- Collaboration among all the industry players -- suppliers, OEMs, dealers, and customers -- is essential.
- Linking complex business processes into a logical flow, maximizing efficiency and satisfying customers' expectations.

Business Benefits

- End-to-end integration of SAP and non-SAP products.
- Offers a single data platform for
  - Engineering
  - Planning
  - supply chain management
  - Procurement
  - customer relationship management.

Business Benefits

- Cost reduction of 3% to 6% per vehicle
  - by changing the supply chain from the traditional push paradigm
  - New level of collaboration and efficiency.
- Groups processes and functions by market segments
  - OEMs, suppliers and aftermarket, or sales and service.

How it works

- mySAP™ Automotive generates delivery schedules to meet assembly-line planning and sequencing directives.
- Long-horizon forecasts and short-horizon J-I-T delivery schedules are sent to suppliers.
  - Electronic Data Interchange (EDI)
  - mySAP™ Automotive Supplier Portal (Internet)
How it works

• BMW gets an advance shipping notification
  – Exact information on part counts and delivery dates
• Upon receipt parts are transferred directly to the line

Additional benefits

• Monitoring the production status in real time
• Recording production confirmation and parts consumption every 3 minutes and adjustment of inventory
• Costs are posted to calculate the value of work in progress
• Seamless collaboration between business partners across the supply chain allows
  – Engineering
  – High-volume production
  – Highly customized products