**Manufacturing Notes**

**Page 1**

**Manufacturing is the converting Raw Materials into Standard Stock and then into Finished Products**

**Major Manufacturing Industries included Automotive, Appliance, Furniture and Steel**

**Form Utility-- Each new form a material takes on gives it more use.**

**Two Major Types of processing**

**1. Primary**

**2. Secondary**

**I. Primary Processing**

 **A. Changes Raw Materials into Industrial Standard Stock**

**1. Raw Materials inside the earth**

 **a. mined under the surface or strip mined**

 **b. extracted by drilling or electrolysis**

**2. Raw Materials that grow**

 **a. grains harvested from farms**

 **b. trees harvested from forrest and tree farms**

 **c. livestock and fish from farms and oceans**

 **B. Types of Raw materials**

**1. Mineral Ores--base metal is extracted**

 **2. Hydrocarbon Liquids (crude oil) - distilled at refineries**

 **into gasoline, diesel, tar**

 **3. Plants-chemically and mechanically processed**

 **4. Animals-chemically and mechanically processed**

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**C. Types of Stock produced**

 **1. Metal - sheet, bar, rod, pipe, ingots**

 **2. Wood - boards, sheet, engineered lumber**

 **3. Plastic - pellets**

 **4. Glass - sheet, marbles**

 **5. Grain - meal, flour**

**II. Secondary Processing**

**Secondary Processing is the changing of Industrial Standard Stock into useful objects. This is Form Utility.**

**Secondary Processing changes the industrial standard stock in shape, appearance, and internal properties through six processes. These may overlap, combine, and may or may not be used to construct objects**

**1. Casting and molding**

**2. Forming**

**3. Separating**

**4. Conditioning**

**5. Assembling**

**6. Finishing**

 **A. Casting and Molding**

 **1. Hot (elevated temperature)**

 **a. hot liquid into a mold (metal or plastic)**

 **b. allow it to cool**

 **c. remove the mold**

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**A. Casting and Molding cont.**

**d. Mold types**

 **1. Expendable--use once**

 **2. Permanent--use two of more times (may**

**eventually wear out)**

 **2. Cold (no temperature change)**

 **a. concrete/mortar**

 **B. Forming**

 **1. Uses a shaping device and pressure to change material shape**

 **2. Material Temperature**

 **a. hot forming--material is heated prior to forming**

 **1. forging-iron**

 **2. blow molding--plastic bottles**

 **b. cold forming--No temperature increase**

 **1. sawing**

 **2. bending**

 **3. squeezing**

 **4. pressing**

 **C. Separating**

**1. Removes Materials to produce a desired shape**

 **(cutting, notching, machining, shearing)**

 **2. Machining**

 **a. traditional--chip removal (drill press, saw, planer)**

 **b. non-traditional-- chipless removal**

 **1. chemicals**

 **2. high-voltage sparks (EDM) electric**

 **discharge machine**

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**C. Separating cont.**

**c. thermal cutting**

 **1. flame with high pressure air (oxy-acetylene torch)**

 **2. intense light (laser)**

 **3. Shearing**

 **a. knives**

 **b. blades**

 **c. scissors**

 **D. Conditioning**

 **1. Uses heat, chemicals, or mechanical means to change**

 **the material properties of the material.**

 **a. heat treating**

 **1. hardening--material becomes brittle**

 **2. tempering--material becomes tough**

 **3. normalizing--material returns to its original**

 **condition**

 **4. annealing--softens material**

 **5. drying--removes moisture**

 **6. firing--ceramics**

 **b. mechanical conditioning**

 **1. cold working--surface hardening**

 **2. shot peening---metal pellets shot at high**

 **speed for making springs**

 **c. chemical conditioning**

 **1. treating lumber for rot and insect resistance (ACQ)**

 **2. shampoo/conditioner--adds oils removed**

 **during washing**

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 **E. Assembling**

 **1. Joining of two or more parts**

 **a. permanent--welding, glued**

 **b. temporary--nails, bolts, screws**

 **2. Bonding**

 **a. welding**

 **b. adhesives**

 **c. soldering**

 **3. Mechanical force**

 **a. bolts/screws**

 **b. press fits**

 **c. shrink fits**

 **F. Finishing**

 **1. Done to protect and beatify the surface of materials**

 **2. May be done at any stage**

 **3. Types of finishing**

 **a. electroplating**

 **b. painting/staining**

 **c. galvanizing**

 **d. polishing**

**f:manufacturingnotes**