**Manufacturing Notes**

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**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**