Outline For Today

- Stamping Basics
- Materials
- Plating
- Design for Molding
- Packaging
- Proto-Types
Stamping Basics

- Die Components
- Class of Tools
- Cost Drivers
Die Components

- Diesets
- Types of tool

Leader Pins For Alignment

Punch Press

Multi-Slide
Basic Types Of Tools

- Compound
- Progressive
- Draw
- Secondary Tools
Compound Die

- Lower Volume
- Flatter Parts
- No Forms
- Burrs All One Direction
Progressive Die

- Cuts
- Forms
- Sizes
- Coining
- Loose or Strip
Traditional Class Of Tools

- Class “C” Tools
- Class “B” Tools
- Class “A” Tools
Class “C” Tools

- Simple One Die Block Construction
- Box Stripper
- Soft Punch Holder
Class “B” Tool

- Some Guiding Of Punches
- Might Have Inserted Cuts
- Spring Stripper
Class “A” Tool

- Higher Volume
- Inserted Cuts
- Hardened Back Ups
- Hardened Stripper Face
- Hard Punch Holder
- All Guided
- Insert Stripper
## Tool Life
### Tool Volume Construction Of Class "A" Dies
*(Type Of Material / Estimated Life Of Tool In Parts)*

<table>
<thead>
<tr>
<th>Vol/Mat'l</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<tbody>
<tr>
<td>100M</td>
<td>LV</td>
<td>LV</td>
<td>LV</td>
<td>LV</td>
<td>LV</td>
<td>LV</td>
<td>HV</td>
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<tr>
<td>250M</td>
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<td>LV</td>
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<td>HV</td>
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<td>500M</td>
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<td>HV</td>
<td>HV</td>
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<tr>
<td>10MM</td>
<td>MV</td>
<td>MV</td>
<td>HV</td>
<td>HV</td>
<td>HV</td>
<td>HV</td>
<td>SV</td>
</tr>
<tr>
<td>25MM</td>
<td>MV</td>
<td>HV</td>
<td>HV</td>
<td>HV</td>
<td>HV</td>
<td>SV</td>
<td>SV</td>
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<td>50MM</td>
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<td>1 Billion</td>
<td>SV</td>
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</tr>
</tbody>
</table>

1. Thin material of .004 or less will require one class upgrade
2. Tight tolerances of ±.001 or tighter may require one class upgrade

Material 1 = Brass, Aluminum, Phosphor Bronze
Material 2 = Beryllium Copper
Material 3 = Cold Rolled Steel
Material 4 = Nickel Silver
Material 5 = Stainless Steel
Material 6 = Nickel Alloys
Material 7 = Titanium
Cost Drivers

- Holes
- Forms
- Flatness
- Edge Condition
Cost Driver - Hole to Edge

- Possible to do but does affect tool cost
- Stations need to be modified to control distortion
Cost Driver - Holes To Form

- Form will distort when formed
- Can perf with a cam after forming
Cost Driver - Very Short Forms

• Difficult to form because of pressure on radius and elasticity of material.

• Short forms can be cut after forming
Cost Driver - Long Forms

- Harder to hold true position at end
- Can add pre-forms to help control
- Shipping may cause parts to change
Cost Driver - Shear Forms

- Extra Cutting Required
- More Maint.
- Tapered
- Can Lock Back Into Metal
Cost Driver - Flatness

- Spring Stripper Will Hold Part While Stamping
- Parting vs. Blanking
- Blank on Pad Will Allow Flattening At Bottom
Cost Driver - Edge Condition

- Square Edges Are Not Capable
- Can Give Up To 80% Shear
- Shave
- Ball Size
Materials

- Steel
- Brass
- Stainless
- BeCu
- Others
Steel

- Cold Rolled Steel
- Most Common
- Many PrePlate Types

**ILLUSTRATION OF TEMPERS**

**No. 1**
HARD for stamping and punching flat products requiring rigidity and strength.

**No. 2**
HALF HARD for easy blanking operations. Will bend at sharp right angles across the grain (direction of rolling).

**No. 3**
QUARTER HARD or MEDIUM SOFT. Will bend down upon itself across the grain and fairly well with the grain.

**No. 4**
PINCH TEMPER for tubing, moulding and some deep drawing work. Will bend both ways of the grain.

**No. 5**
DEAD SOFT for deep drawing and difficult forming operations. Is extremely soft and will bend down upon itself both ways of the grain.

Heavier than .069
Rockwell B84 Min.
.069 and lighter
Rockwell B90 Min.

Rockwell B70-85
Rockwell B55-70
Rockwell B65 Max.
Rockwell B55 Max.
**Steel - Common Coatings**

<table>
<thead>
<tr>
<th><strong>ELECTROLYTIC TIN COATED STEEL</strong></th>
<th><strong>LONG TERME STEEL SHEET (Soft and Ductile)</strong> Sizes .015 to .062. Standard Coating. Stocked in Prime Commercial quality meets all A51 standards. Other tempers available upon request. Coils or cut lengths.</th>
<th><strong>ELECTRO GALVANIZED SHEET</strong> SHEET Standard commercial quality, plain or bonded. Will not flake or peel under the most severe forming or drawing operations. Sizes from .010 to .062. Available in coils or cut lengths. All tempers.</th>
<th><strong>HOT DIPPED GALVANIZED SHEET</strong> SHEET (Soft and Ductile) All sizes in standard commercial quality and lock forming quality. Drawing quality, spangle finish standard, min. spangle and min. spangle extra smooth available upon request, bonded on special order. Coils/lengths.</th>
<th><strong>BLACK BEAUTY SHEET</strong> Standard range of sizes from .015 to .062. Commercial quality. Quarter hard and deep draw quality available. Coils or cut lengths. Slitting or shearing to exact sizes.</th>
<th><strong>ALUMINIZED SHEET</strong> Type 1—Sheet steel hot-dip coated on both sides with aluminum-silicon alloy by the continuous method. Type 2—Available on special order where atmospheric corrosion resistance is of primary importance. Coils or cut lengths.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXCELLENT</td>
<td>GOOD</td>
<td>GOOD</td>
<td>EXCELLENT</td>
<td>EXCELLENT</td>
<td></td>
</tr>
<tr>
<td>Because of bright, shiny surface used in manufacture of toys, kitchen utensils, etc.</td>
<td>Finish generally acceptable on interior parts.</td>
<td>Used in exterior farm equipment, fencing, garbage cans, etc.</td>
<td>Used without further finishing for interior parts in the electronics, appliance, and toy industries.</td>
<td>Used without further finishing for interior parts subjected to elevated temperatures.</td>
<td></td>
</tr>
<tr>
<td>GOOD</td>
<td>GOOD</td>
<td>EXCELLENT</td>
<td>EXCELLENT</td>
<td>EXCELLENT</td>
<td></td>
</tr>
<tr>
<td>Particularly in matte finish, accepts paint well. Bright finish can be color coated with Gold or Brass to simulate plated finish.</td>
<td>Paint usually not required.</td>
<td>When bonded finish is used. Used in sign blanks and other applications where added rust protection is required.</td>
<td>When bonded. The new min. spangle extra smooth can be painted to give a smooth finish with no indication of spangles showing thru. Used for steel rocker panels, etc.</td>
<td>Type 1 and Type 2</td>
<td></td>
</tr>
<tr>
<td>FAIR</td>
<td>GOOD</td>
<td>FAIR</td>
<td>FAIR</td>
<td>Type 1—GOOD</td>
<td></td>
</tr>
<tr>
<td>Used on interior parts not subject to weathering or excessive moisture.</td>
<td>Used in interior automotive gas tanks, roofing shingles, etc.</td>
<td>Used in exterior applications where moisture and weathering occur, such as gutters, garage cans, fire extinguisher brackets, etc.</td>
<td>Used on interior parts not subject to weathering or excessive moisture.</td>
<td>Type 2—EXCELLENT For exterior applications.</td>
<td></td>
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<tr>
<td>EXCELLENT</td>
<td>EXCELLENT</td>
<td>EXCELLENT</td>
<td>EXCELLENT</td>
<td>EXCELLENT</td>
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</tr>
<tr>
<td>Equal to forming qualities of the base metal used. Coating tightly adheres to surface in forming and drawing applications.</td>
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<td>Equal to forming qualities of the base metal used. Coating tightly adheres to surface in forming and shallow draw applications.</td>
<td>Equal to forming qualities of the base metal used. Coating tightly adheres to surface in forming and drawing applications.</td>
<td></td>
</tr>
<tr>
<td>GOOD</td>
<td>EXCELLENT</td>
<td>GOOD</td>
<td>GOOD</td>
<td>POOR but can be spot or seam welded.</td>
<td></td>
</tr>
<tr>
<td>Poor but can be spot or seam welded.</td>
<td>Needs good fluxing agent.</td>
<td>May require different lubrication from uncoated metals.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Brass

- Mostly Available
- Good Electrical
- Can Get Pre-Plated
- Some Spring
- http://www.olinbrass.com/
Stainless

- Good Spring
- No Secondary Process
- Can Have Many Nice Finishes
- http://www.olinbrass.com/stainlessdag.html
BeCu

- Good Electrical
- Good Spring Forces
- Little Stress Relaxation
- Longer Lead-times
- Most Expensive
Others

- High Nickel
- Phos Bronze
- 7025
- Inlayed
Plating

- Types
- Processes
- Post-Plate
- Pre-Plate
Reel-to-Reel Plating Technology

Duplex Controlled Depth

Belt Masking Multi Stripe AMP Presentation

Rotary Brush / Controlled Depth
Plating

- Nickel Thickness Drives Time To Process
- Tin Can Contaminate Wire Bonding Depending On Proximity To Bond Area
- Gold
- Palladium
- Need Approximately .100 min Separation
Plating

• Brush
• Control Depth
• Mask Or Belt

Gold
- Soft
- Hard

Nickel
- Electrolytic
- Electroless
  * Ni Phosphorus
  * Ni Boron

Silver

Palladium

Palladium Nickel

Copper

Tin
- Pure
- All Solders

AMP Presentation
Plating Processes

- Barrel
- Rack
- Strip
Design For Inserts

- Shut off
- Tie Bar
- Hold Down in Plastic
- Tolerances
Design for Inserts - Shut off Flats

- Size consideration
- Length of Tabs
- Width Tol.
Design for Inserts - Shut off Flats

- Burrs
- Forms
Design For Inserts - Tie Bar

- More Tie Bars Are Better
- Holds Parts Together
- Allows Tighter Location Tolerances
Design For Inserts - Hold Down in Plastic

- Coined Ears
- Holes For Anchors
- Semi-Perf
- Locking Tabs
Design For Inserts - Continuous Strip

- Tie Both Ends
- Smaller Parts
- Ladder Strip
Design For Inserts - Continuous Strip

- Ladder Strip
- Most Stable
Packaging

- Bulk
- Plastic Trays
- Reel to Reel
Proto-Types

- Laser
- Chem.. Etch
- Die Cut
- Wire Cut
Proto-Types - Laser

- Short Lead Times
- Burr Free
- Cost Effective
Proto-Types - Laser

- Material Thickness to be Between .001” min to .500” max on all Steels. Coppers and Brasses to be Between .001” min and .160” max.
- Positioning Tolerances can be held to .00039” and Repeatability of .00019”.
- Careful Consideration for Cross Section due to Heat Effect Zone.
Proto-Types - Chem Etch

- Hold Tight Tolerances
- Burr Free
- Work with Smaller Parts
- Some Edge Condition
Proto-Types - Chem Etch

- Material Thickness Between .0005” min to about .100” max.
- Etching Precision can be held to within .0005”
- Lead Times about 5 - 10 Days.

The Diemasters
Manufacture Smarter