Technical Brief: Forming and Blanking of Solid Zinc Strip

General Forming

The forming properties of most Jarden solid zinc strip alloys are very good. The material lends itself to all conventional forming methods. In a number of applications involving relatively severe forming, zinc strip parts have been successfully formed on tooling designed for use with steel, aluminum and brass. Where the nature of forming is more severe, the very properties that make zinc unique will, in some applications, require modifications of the tooling or forming conditions.

Blanking

For short run blanking operations, steel rule dies and short-run type tooling can be used very successfully for blanking zinc strip alloys. Hardened steel dies will give exceptional performance due to the non-abrasive properties of zinc strip. Only for extremely long runs should carbide be specified. A punch to die clearance of 5-10% of metal thickness is recommended, although this can be reduced in some applications to provide a greater sheared edge percentage. Many types of lubricants will give good results, water-soluble types are normally recommended.

Deep Drawing

Jarden's Zinc Products has a great deal of experience with deep drawing of zinc strip alloys which has been acquired in the manufacture of battery cans. These are customarily made on transfer equipment at high speeds. Carbide dies have produced as many as 300 million parts with less than .001 inch wear.

Punch Radii: Punch radii should be as generous as the part design will permit. This is true of almost any metal forming operation. The final punch radius should not be less than two times the stock thickness. On redraw punches, the radius should be approximately half of the diametrical reduction in the following station.

An inadequate radius will tend to rupture the bottom of the part, whereas an excessive radius will create "butt" wrinkles.

Annealing: There is no need for annealing between draws. Zinc strip alloys are self-annealing because of the heat generated in drawing.

Lubricants: When a lubricant is required, many lubricants-both neat and extended-can be used. Most non-aggressive lubricants with a relatively neutral pH are acceptable.

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Cleaning: Parts may be cleaned by vapor degreaser or mild alkaline washes. Parts should be thoroughly dried after cleaning. Cleaning after drawing is important because some lubricants may etch or stain the zinc strip if allowed to remain on the part.

Steps For Laying Out Deep Drawn Parts:

1. Calculate the area of the part allowing 1/4 to 1/2-inch on the height for trimming. The amount left for trimming depends on part size, type of drawing, stock thickness compared to part thickness and method of trimming.

2. Calculate a blank size having the same area.

3. Calculate the first draw or cup diameter. This should not exceed 45% of the blank diameter. The greater the reduction, the more critical tooling and lubrication become. A good starting point is 35% reduction using a blank holder or pressure pad.

4. Calculate the number of redraws required for the finished part. Redraw reductions may vary up to 25% depending on length to diameter ratio, stock thickness, lubricants or the use of draw sleeves. If draw sleeves are not used, reduction of up to 14% will generally work well.

5. Parts may be pinch-trimmed to produce a very acceptable trimmed edge.

6. Die Radii: A too large or too small die radius will cause wrinkles in the part. As a rule-of-thumb, the die radius should be approximately one-half the reduction plus three times the material thickness. Draw lands may vary from 1/32 to 1/4 inch depending on the type of draw. Clearances between punch and die may vary from ironing the metal to 100% of stock thickness. However, no abrupt change should take place between one draw and the next.

The comments on punch and die radii are based on Jarden's considerable experience with transfer presses. They will apply, with some modification, to tooling as well. Deep drawing on single-station, double-acting presses will require further modifications. As noted, these areas are the subject of an intensive research program at Jarden and the assistance of Jarden's engineers is available if it is needed on any particular application.

Selection Of Material

Properties of the different zinc strip alloys vary considerably. Jarden will be glad to evaluate your part or part print and to recommend the most suitable alloy for the application.

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Roll Forming

Zinc strip alloy is easily roll-formed by conventional means. Extremely small springback values for fully yielded shapes allows difficult sections to be formed accurately without extraordinary tooling means. Due to the non-abrasive nature of the zinc surface, normal lubricant use will virtually eliminate tool wear as compared to experience with other metals.

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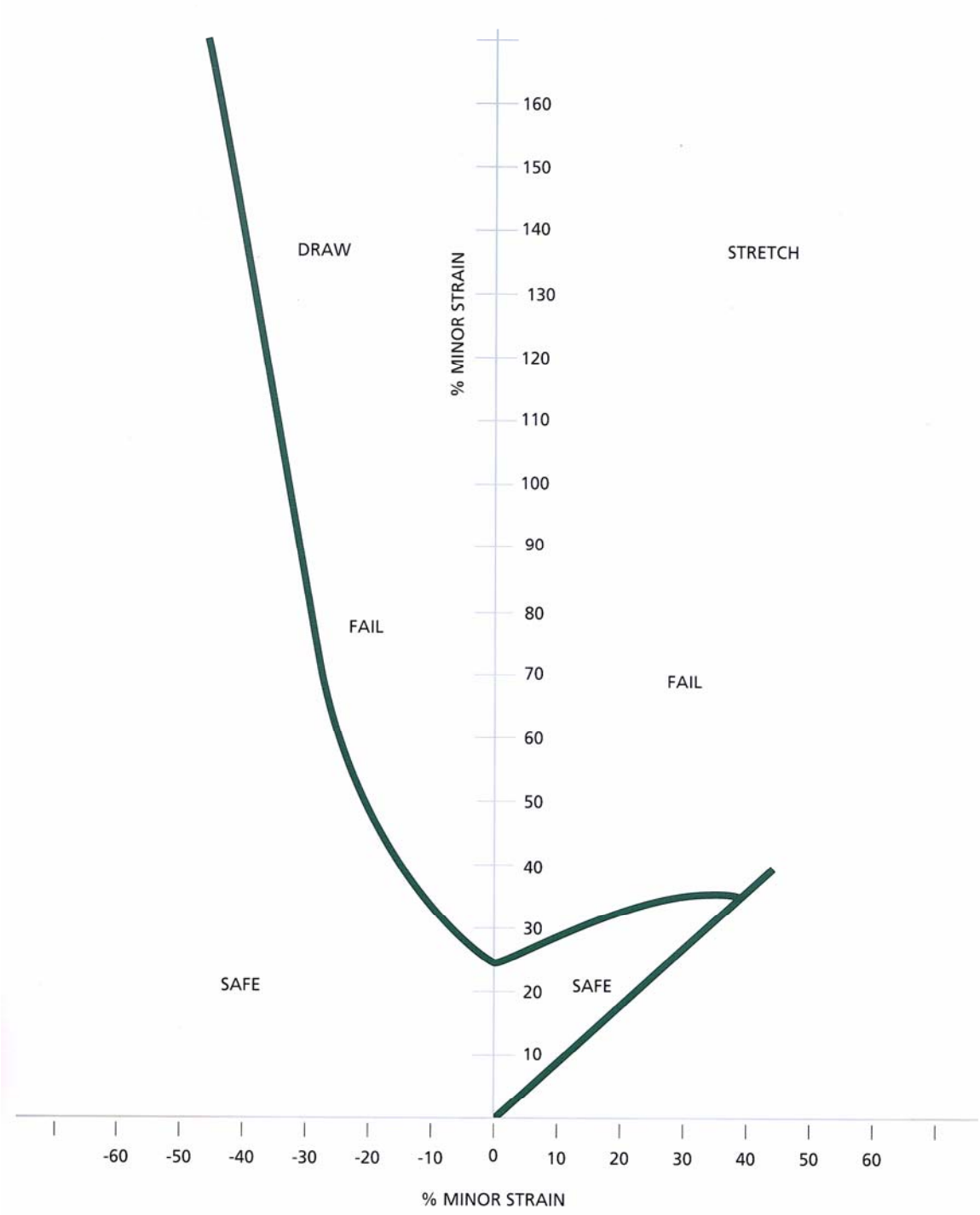
Forming And Blanking Of Solid Zinc Strip

Figure 1 -- Forming Limit Diagram, Alloy 190, .035"



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