

Blanking developments

Part II: Fineblanking part, process design

Editor's Note: This is Part II of a three-part series on blanking developments. Part I, which appeared in the July issue, focused on fineblanking and tool design. Part III, appearing in the September issue, will cover high-speed blanking and finite element analysis.

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The automotive industry is increasingly accepting fineblanking in its various forms to produce sheet metal components with smooth edges that don't require additional finishing operations.

Press Ram Travel

A typical fineblanking ram cycle is shown in Figure 1. From the bottom dead center (BDC) where the tool is fully open, the ram moves up at a fast travel speed as far as a pre-

set tool gap. Ram speed is reduced at point b to allow a sensing operation. It then begins its blanking travel per second (c) at a lower speed. Blanking speed is important and can be varied between 5 and 50 mm/s based on the material. At top dead center (TDC), blanking is complete and the ram returns rapidly to BDC (d).

Part Design

Fineblanked parts require a high cut surface quality, close dimensional tolerances, and flatness. A part's geometric shape, sheet metal thickness, and material characteristics determine if fineblanking is possible. Part features such as slot width, section width, hole diameters, tooth forms, corner angles, and radius determine how difficult it will be to blank the part. Extremely small holes with a blank-thickness-to-hole-diameter ratio of about 2 also can be fineblanked without any major problems.

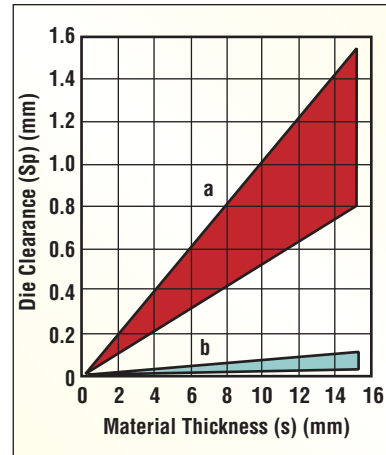


Figure 2

Depending on material thickness, a clearance value between 5 and 10 percent is used in conventional blanking (a), whereas 0.5 percent clearance is more common for fineblanking (b).

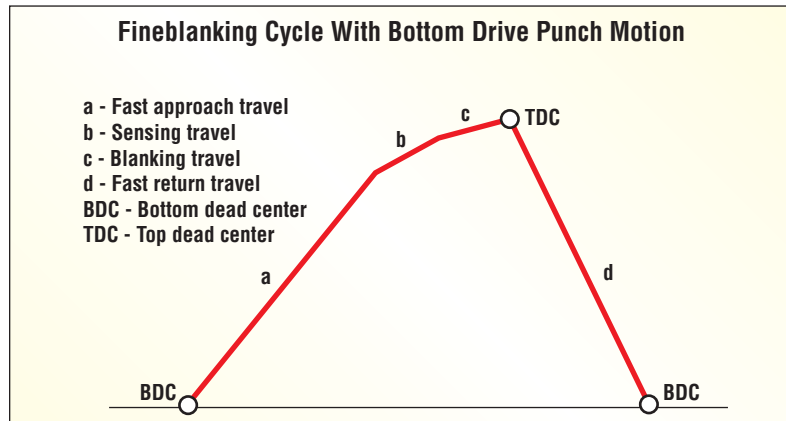


Figure 1

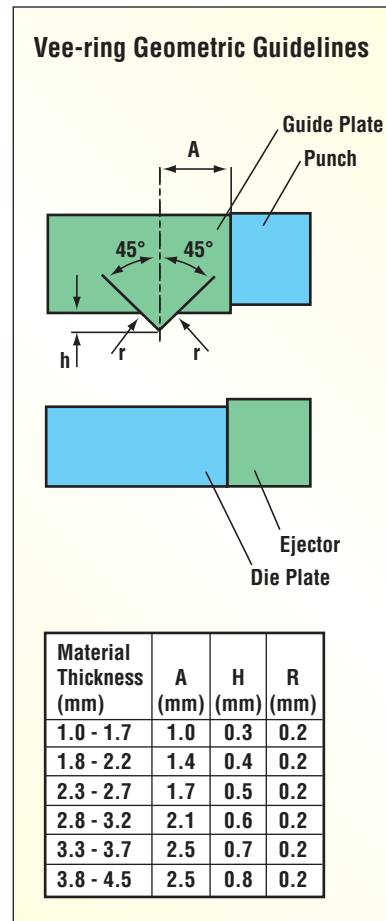


Figure 3

Dimensional, Form Tolerances

Achievable part tolerances depend on the material, workpiece thickness, and geometric shape. The blanking press, die, and lubricant also are significant in determining achievable part quality. For example, die-roll width depends on die-roll height. Cut surfaces are not absolute right angles to the plane of the sheet metal. The blank's outside contours on the burr side are greater than at the die-roll side. A guideline is the difference amounts to 0.0026 mm per 1 mm of blank thickness and depends on a number of influencing variables.


Tool Design Parameters

Die Clearance. In conventional blanking and fineblanking process-

es, die clearance is one of the most important process parameters because it affects sheared surface quality. In practice, die clearance is expressed as a percentage, the ratio of clearance length (one side only) to sheet thickness. A clearance value between 5 and 10 percent is used in conventional blanking, whereas 0.5 percent clearance is more common for fineblanking. **Figure 2** shows the change in die clearance with changing material thickness.

Vee-Ring Dimensions. A significant fineblanking tool feature is Vee-ring dimension. Its function is to hold the punched material under compressive stresses. Vee-rings can be located either on the guide plate or the die plate or on both. Material thickness dictates if

a single Vee-ring or two Vee-rings, one on the guide plate and the other on the die plate, are necessary. Vee-ring dimensions and the distance from the blanking edge depend on sheet metal thickness.

Figure 3 shows the geometric guidelines for a Vee-ring design located on the upper die plate. 

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