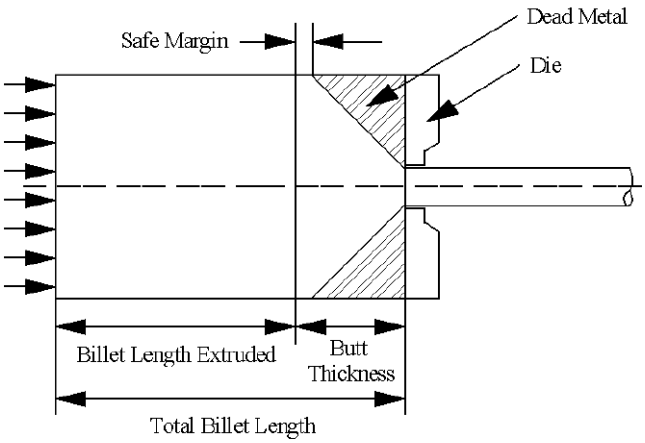
CASTOOL
TOOLING SYSTEMS

MANAGING THE BUTT

Butt Formation

During the extrusion stroke, as the ram and the dummy block press the billet through the container, the actual flow of alloy into the die is tapered. This leaves a dead metal zone at the end of the container, surrounding the cone-shaped section of flowing metal. Oxides, and other inclusions and impurities from the skin of the billet, accumulate in this area. Care must therefore be taken to ensure that extrusion is stopped before this contaminated alloy is carried through the die, and into the product. This residue then forms the butt that adheres to the back of the die stack.

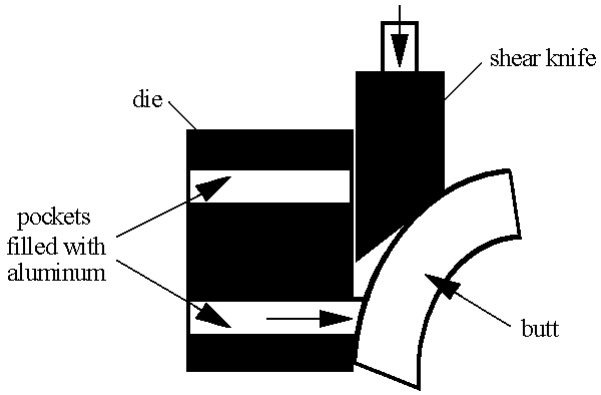


Relationship between dead zone and butt thickness

After each billet has been extruded, the container is opened to expose the butt. This must then be sheared off before the container is closed, and the next billet loaded.

If this operation is not done efficiently and cleanly, part of the butt can 'hang up' or continue to stick to the back of the die stack. This will prevent the container from closing completely.

If this condition is not detected before the next extrusion stroke, disastrous damage to the press will almost certainly result. Also, if the butt is not properly sheared, it can pull alloy from the die, contributing to front end blisters.



Sheared butt-end of a prothole die

Butt Thickness

The necessary thickness of the butt can vary considerably. It depends primarily on the type of alloy being extruded, the condition of the billet, and the end-use of the product being extruded. For example, a billet of AA6060 alloy, having a smooth surface with minimum shell, that is being used for a non-structural application such as window frames which will be painted, may be extruded down to a butt of less than 5% of the billet length. On many presses, this may be a half-inch or less. The strength of the weld is not a problem, and any discoloration of the product due to impurities in the alloy will not remain visible.

On the other hand, when an AA6061 billet is being extruded into shapes that will have structural use, 10-20% of the billet must be left in the butt to ensure that the skin doesn't enter the core of the profile and result in a faulty weld in the extrusion that may not meet the specified strength.

Butt Lubrication

Lubrication is essential, to ensure that the dummy block will separate instantly and effortlessly from the butt, without pulling extruded section from the die.

Hydrocarbon lubricants are often used to prevent the butt from sticking to the shear or the die stack. Used sparingly, they can be effective. Applied too liberally, however, they will create blisters. Also, if trapped in the ports of the die, these lubricants will result in defective welds, both transverse and longitudinal. A lubrication system that uses a benign lubricant, boron nitride in solution, is now available.

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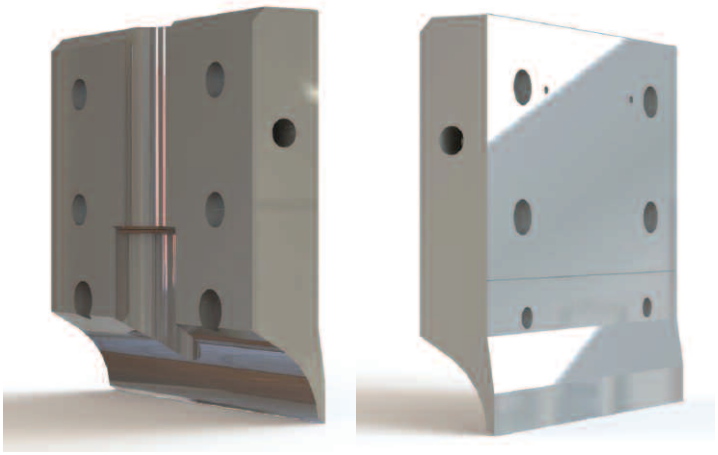
Today the ultimate lubricant to facilitate butt shear is boron nitride. Boron nitride is the ideal lubricant, not only for its unmatched lubricity, but also for its ease and economy of application. Environmental problems are eliminated and scrap due to blisters is reduced.

Butt Shear

The butt shear must, of course, have sufficient force to separate the largest butt, of the hardest alloy, from the back of the die stack. Because the shear operates directly across the face of the die stack, it is essential that a consistent clearance be maintained between the shear blade and the tooling. This clearance is usually about 0.020 in. (0.51mm).

Unless the press is equipped with a mechanism to bring the die face to a precise set point prior to shearing the butt, the clearance must be preserved by meticulous management of the press tooling, and exact set-up and maintenance of the press shear.

Leading extruders are very much aware of the importance of accurate die stack dimensions, and often machine their incoming tooling to their own exacting standards. They rigorously maintain the condition of their presses, ensuring that all clearances remain at the originally designed dimensions, and the die slide operates effectively. They rarely experience problems with shearing the butt.



Shear Blades

Because of the wide range of shapes extruded on many presses, from light architect-ural AA6060 profiles to large diameter AA6061 rod, the blade of the butt shear must, of course, be strong enough to cleanly shear the largest shapes in the hardest alloys being extruded. The optimum design of the shear blade varies with the size of the press, and the alloy – shape combination to be sheared.

The cutting edge of a shear blade for softer alloys, which may be extruded down to a thin butt, is sharp and often plow-shaped. With it, the butt is literally peeled from the die. For shearing large butts of hard alloy, however, a block blade is commonly used for its strength.

The shape of the cutting edge of Castool blades is designed and customized to meet the individual requirements of the extruder. Castool blades are also tempered to a toughness that resists chipping, and ensures an extra long operating life.

Managing the Butt

The importance of calculating the optimal thickness of the butt, applying appropriate lubrication, then shearing it cleanly and efficiently, is often underestimated by extruders. The success of this seemingly minor part of the extrusion process is sometimes taken for granted... until something goes wrong. The consequences then can be costly.

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