

Silhouette Dies

Silhouette dies are the simplest forming die used extensively with hydraulic presses. They are capable of small and large production runs, and are the easiest die to construct. They are usually made from a plate of aluminum, steel, brass, or Plexiglas. The profile or silhouette of the shape to be formed is cut into the silhouette die plate (Figure 10).

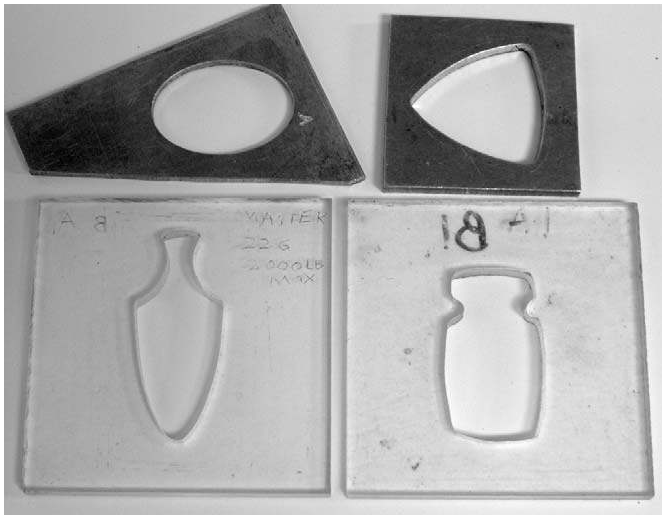


Figure 10

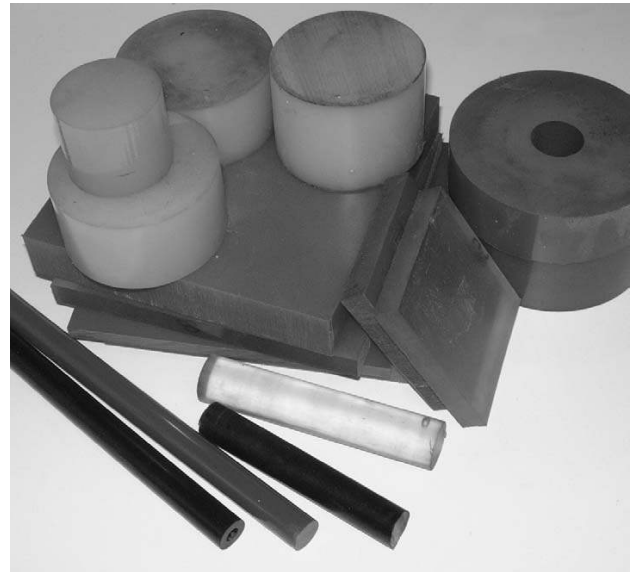


Figure 11

Silhouette dies and non-conforming dies typically use polyurethane to act as the mating surface (Figure 11). Polyurethane is an elastomer (rubber-like) material used to form metal into or over a die. It has greater abrasion and tear resistance in combination with increased load-bearing capacity than rubber, and it does not compress under pressure. When polyurethane is placed under pressure, it changes its shape while its volume stays constant, behaving like a "solid fluid." As it deforms or deflects, it transmits the applied force in all directions, exerting high, uniform, and continuous pressure. When the pressure is released, it returns to its original shape and is reusable for thousands of work cycles. Polyurethane is an ideal medium when using a hydraulic press, as it offers consistent and economical results. Figure 12 illustrates a typical silhouette die setup with the metal to be formed placed between the polyurethane and the silhouette die.

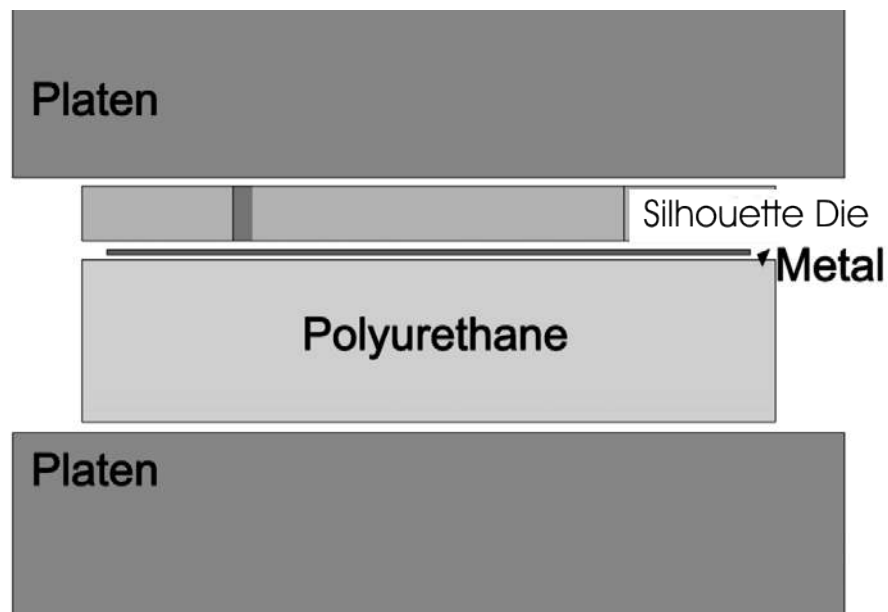


Figure 12

Polyurethane is available in a wide range of hardness, which is measured and referred to as durometer. The soft or low-durometer polyurethane is ideal for moving large areas of metal into low detail dies. The hard or high-durometer polyurethane is best suited for bringing out the finer details of a die. Figure 13 illustrates the effect of soft, 60-durometer polyurethane forming metal into a deep silhouette die. Figure 14 illustrates the effect of hard, 95-durometer polyurethane forming metal into the same die. Note the differences between Figure 13 and Figure 14. The 95-durometer polyurethane forms the metal shallow but it also sharply defines the edge of the die compared with the 60-durometer polyurethane, whereas the 60-durometer forms the metal much deeper into the die, but the edge is not as well defined.

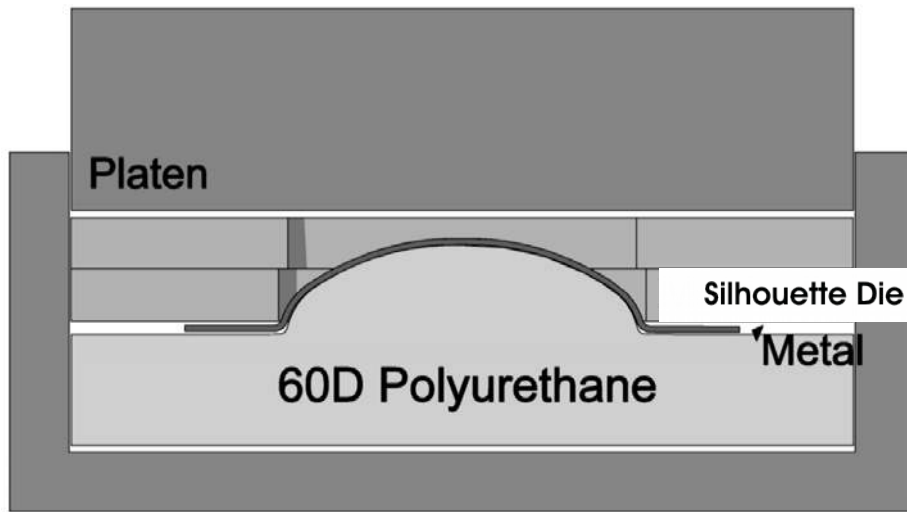


Figure 13

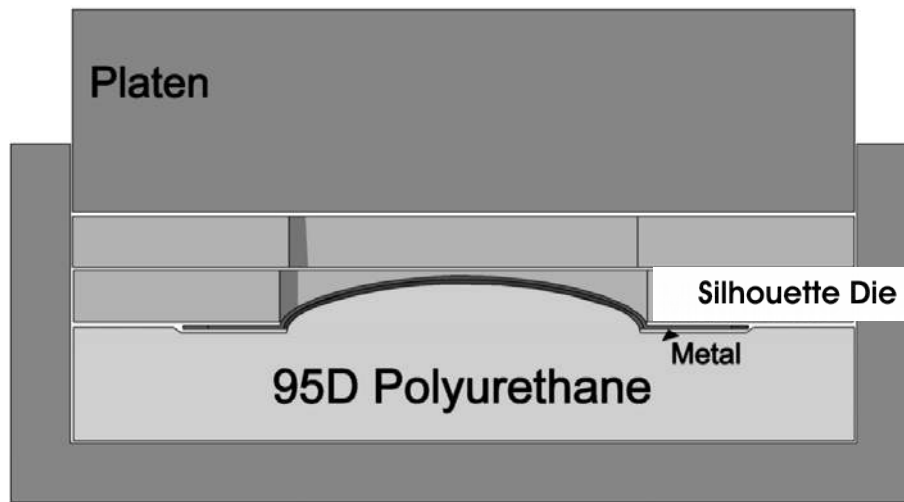


Figure 14

It is common to use several different durometers of polyurethane in any given die. One might start with soft polyurethane to move a large amount of metal into the die and then progress to hard polyurethane to define the edge and details of the die.

When polyurethane is under pressure it seeks the path of least resistance; in this case we see it displacing itself both into the perforation of the silhouette die and outward (Figure 15).

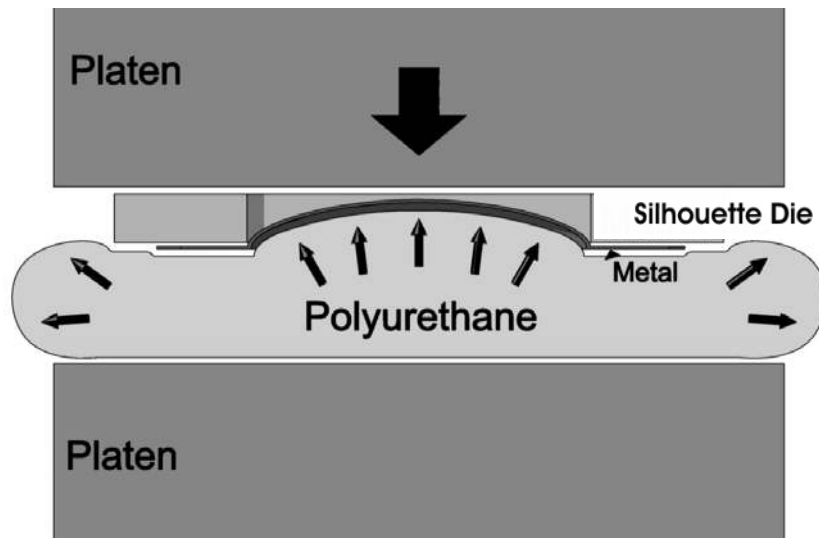


Figure 15

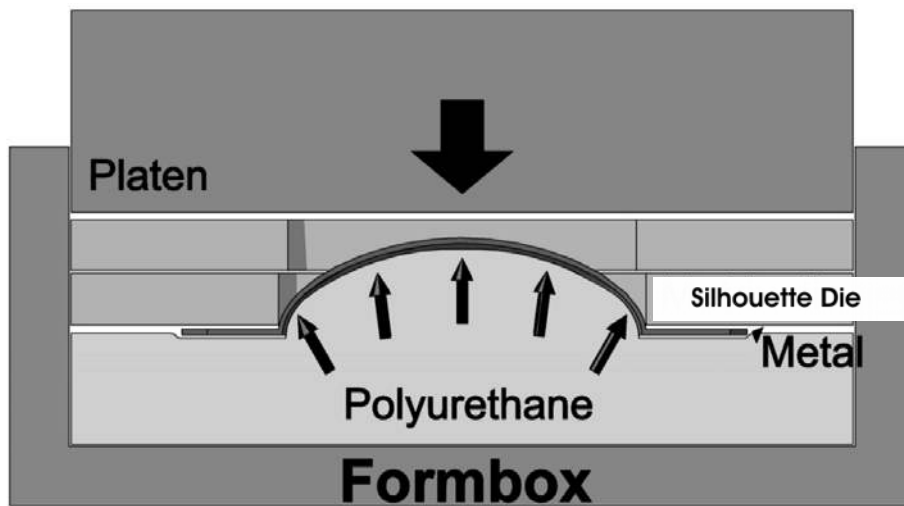


Figure 16

If the polyurethane is fully contained we are then able to direct all of its movement into the die for greater efficiency (Figure 16). One approach to the containment of the polyurethane is to place it into a steel box, also known as a formbox.

Figure 17 shows a variety of different polyurethanes in containers. The round steel platen shown is designed for full contact with a round container of polyurethane.



Figure 17

Examples:

Figure 18 shows a plate of acrylic with three silhouette dies cut into it. An aluminum faceplate has been added for two reasons: to increase the strength of the inside die edge where the metal rolls over, and for die longevity. Figure 19 shows the finished “fish” spoons created with this silhouette die. Figure 20 shows an example of a silhouette die on the right, and its finished piece on the left.



Silhouette Die

Figure 18

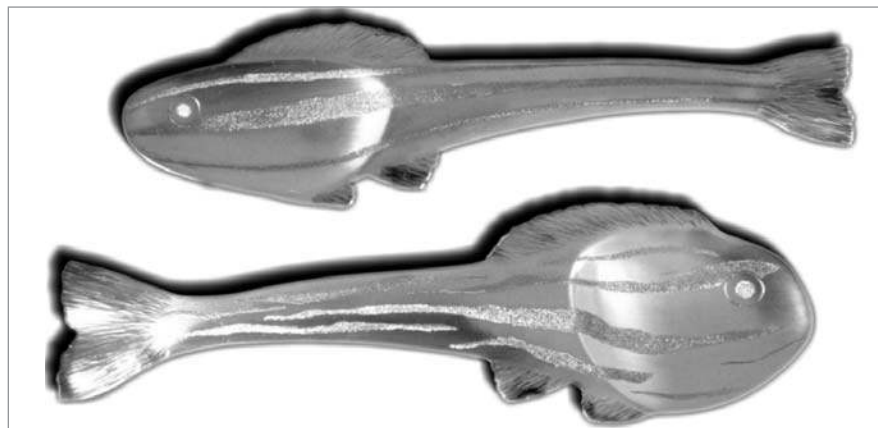


Figure 19

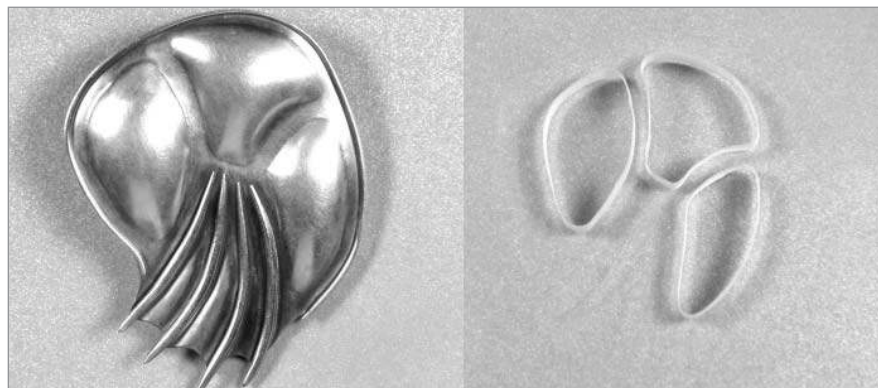


Figure 20

Process

The creation of a silhouette die starts with an accurate layout for cutting. Shown in Figure 21 is a plate of Plexiglas being cut with a jeweler's saw. Note that the saw is connected to a precision saw guide. This insures that an accurate cut is perpendicular to the surface of the Plexiglas. By cutting perpendicular to the surface of the Plexiglas we are able to use both sides of the die to press mirror images of the same shape. These mirror images can then be joined to form a vessel (see Figure 25).

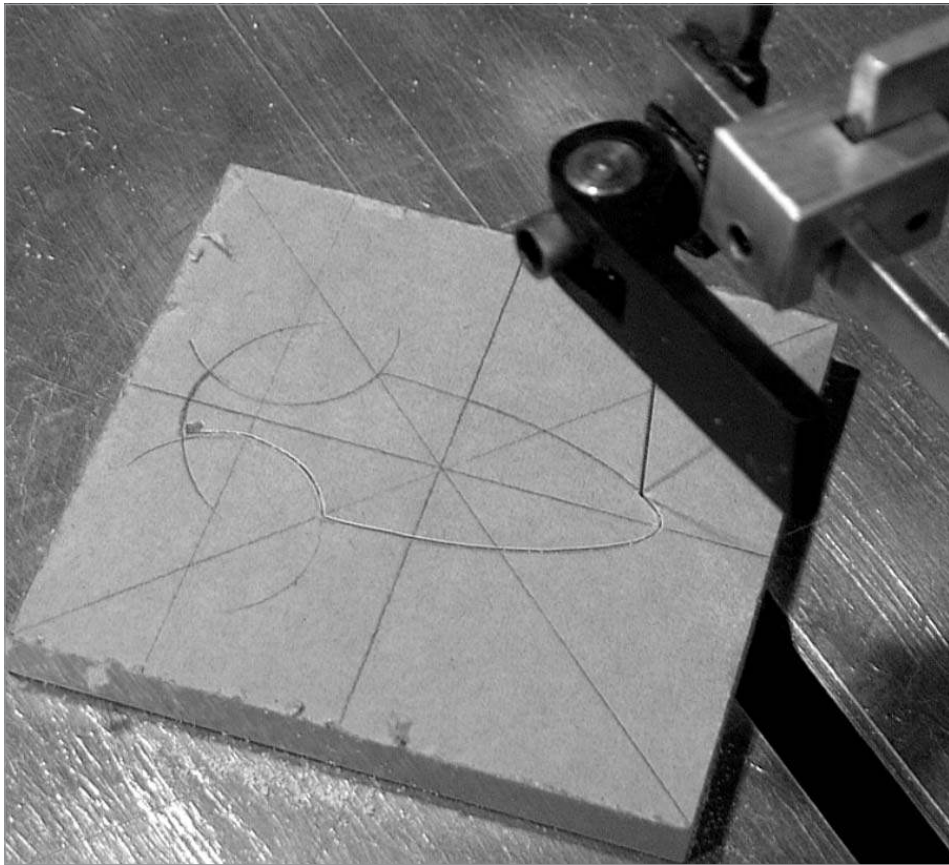


Figure 21

Once the die is cut, it is placed on top of the plate of metal to be pressed. The metal and die are then placed on top of a block of polyurethane contained in a formbox. Figure 22 shows the Plexiglas on top of a plate of sterling, under which is a block of 60-durometer polyurethane. All of this is contained in a 3" x 3" steel box.

The entire assembly is then pressed, which forces the polyurethane to push the

metal into the void of the die. Figure 23 shows the formbox in the press after the metal has been formed into the void of the die.



Figure 22



Figure 23

Figure 24 shows a group of forms that were pressed into the die shown in Figure 23, and then trimmed to leave a small flange.



Figure 24