

Metal Forming



SB-11(a)



SB-11(b)

Many common metal products are mass produced at room temperature from sheets of ductile metals such as steel and aluminum. These include automobile body panels, motorcycle fenders and gas tanks, the exterior surfaces of aircraft, and everyday items such as pots and pans. Most of these items are shaped by a *die forming* process that exerts tensile forces on the metal while deforming it beyond its elastic limit or yield point. The extent to which the metal may be shaped without failing by thinning, cracking, or rupture is defined by its *formability limit*.

In contrast, *hand forming* methods, some of which date back several centuries, use compressive forces in the shaping process and are particularly effective for *strain-sensitive* materials such as aluminum. Such methods also allow the creation of intricate shapes, such as compound curves, by exceeding the formability limits for tensile processes. In SB-11(a), for instance, a 1930s vintage power hammer is being used to develop a complex stainless-steel prototype for the exhaust-discharge nozzles of a modern helicopter. The primary disadvantages of hand forming are that it is time consuming and expensive. Nevertheless, these techniques are alive and well due to a renewed interest in the restoration of antique vehicles and aircraft, creation of custom-built automobiles and motorcycles, and fabrication of decorative architectural shapes. The craftsman shown in SB-11(b), for example, is using an air-driven planishing hammer from the 1950s to smooth the newly formed fender of a 1932 street rod. (Courtesy of Fay Butler Fab/Metal Shaping, Wheelwright, Massachusetts, www.faybutler.com)