Chapter 15

Press work applications

Presses used industrially to form and shape metal consist of a solid bed on to which a rigid movable platen closes, usually under hydraulic power. Dies of appropriate type are inserted between the two sides of the metal to achieve the necessary shape. These dies may actually cut the metal (stamping and punching) or deform it by stretching the material and producing the required three-dimensional shape.

Press operations

The method is capable of high accuracy and speed. A part forged by drop hammer (Chapter 14) will sometimes be inserted into a press for final finishing. Seldom is any hand-finishing needed after the work is removed from a press. Much press work is completed at a single stroke (single action press) but two or even three press operations may be required according to the strength and complexity of the part. Some presses use rubber pads attached to the upper (movable) platen. Contrary to popular belief, rubber is practically incompressible but it will change its shape readily under pressure and flow in all directions, transmitting pressure as it does so, much in the same way as a hydraulic fluid.

Various presses are available to meet the wide demands of industry. They range from giant 5000-ton models exerting about 2000 pounds pressure per square inch on to the work down to small, single-action units which work at very fast rates.

The whole process is reminiscent of forging. A press resembles a slow-moving drop hammer. Press forging is obviously directly analogous. However the major difference is that in press work the workpiece is not heated but shaped or cut at room temperature. It is a matter of judgement and experience just how far a given metal can be deformed before it will tear.

Press operation is a vital process in the manufacture of automobile body panels and other car parts, aircraft structures and many domestic appliances. When a large press is available it can often be used economically by making small parts en masse using multiple dies in just the same way that this is done in die casting (Chapter 10) and
investment casting (Chapter 13).

Some press operations involve passing the part sequentially through three or more separate presses. Whatever the operation, the method used is essentially the same — pick up the stock (usually flat sheet), place it between the press faces in correct registration with the dies, operate the press, remove the part, stack it or, if the operation is a sequential one, place it in the next press. In robot parlance, these are ‘pick and place’ operations.

**Apparent opportunities for robots in press work**

Press operation is a dangerous job. Sheet metal stock often has sharp edges which can cut operators handling it. The press, once operated (through a clutch mechanism which transmits the drive) is remorseless and will sever the limbs of any operator unlucky enough to be caught between the platens as the press faces close. Strict safety regulations govern the use of such presses, although unfortunately these are not always enforced. Typical among the requirements for safety are electronic devices which make the press inoperative when hands or other parts of the operator intrude during a press cycle. The risks would be thought to be sufficient to justify the use of robots in press work regardless of cost, but this has not been the case to date.

In the early days of industrial robots it seemed quite logical to assume that they would be in great demand for press loading and unloading, but this was to some extent an unfulfilled aim. The great preponderance of press operations requires that the pieces of stock be fed manually because they are not orientated accurately enough at the input station for the robot to be able to grasp them reliably. Much of the operation is single shot, which leaves little opportunity for the robot to engage in press-to-press transfer where it would be expected to come into its own. Another consideration is the speed at which many presses operate, much too fast for a robot. However the robot has found its way into the press shops and is particularly at home where the parts are larger and the cycle time correspondingly slower. Its main role is in loading the press, although load-unload and press-to-press transfers are not uncommon. It is all a question of economics which is in turn dependent upon production rate (or press speed). If, for example, the robot has to go through a complicated maneuver to turn the part over in moving it from one press to another, this can be time-consuming in an industry where a five-second transfer time is not regarded as particularly short.

Finally, the robot, as always, must compete with standardized automation equipment in the form of stacking machinery and limited-sequence machines, all of which are used extensively in the industry. Despite the apparently gloomy outlook for robots, they have found