

DRAWING

Drawing is a metalworking process which uses tensile forces to stretch metal. It is broken up into two types: sheet metal drawing and wire, bar, and tube drawing. The specific definition for sheet metal drawing is that it involves plastic deformation over a curved axis. For wire, bar, and tube drawing the starting stock is drawn through a die to reduce its diameter and increase its length. Drawing is usually done at room temperature, thus classified a cold working process, however it may be performed at elevated temperatures to hot work large wires, rods or hollow sections in order to reduce forces

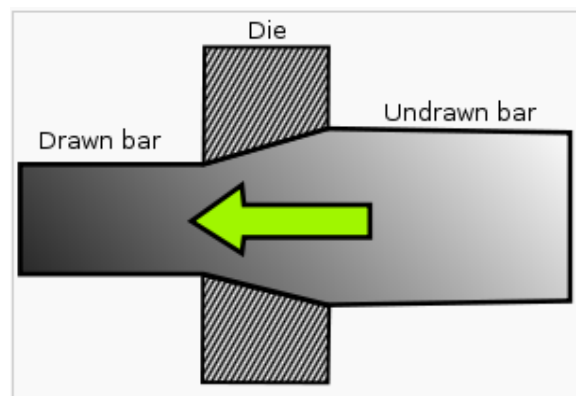


Fig. 1 Drawing

Bar, tube, and wire drawing all work upon the same principle: the starting stock drawn through a die to reduce the diameter and increase the length. Usually the die is mounted on a draw bench. The end of the workpiece is reduced or pointed to get the end through the die. The end is then placed in grips and the rest of the workpiece is pulled through the die. Steels, copper alloys, and aluminium alloys are common materials that are drawn.

Drawing Dies

Drawing dies are typically made of tool steel, tungsten carbide, or diamond, with tungsten carbide and manufactured diamond being the most common. Synthetic diamond is usually used in the early stages of the drawing process, whereas natural diamond dies are used in the final stages. For drawing very fine wire a single crystal diamond die is used. For hot drawing, cast-steel dies are used. For steel wire drawing, a tungsten carbide die is used. The dies are placed in a steel casing, which backs the die and allow for easy die changes. Die angles usually range from 6–15° and each die has at least 2 different angles: the entering angle and

approach angle. Wire dies usually are used with power as to pull the wire through them. There are coils of wire on either end of the die which pull and roll up the wire with a reduced diameter. Drawing can also be used to produce a cold formed shaped cross-section. Cold drawn cross-sections are more precise and have a better surface finish than hot extruded parts. Inexpensive materials can be used instead of expensive alloys for strength requirements, due to work hardening

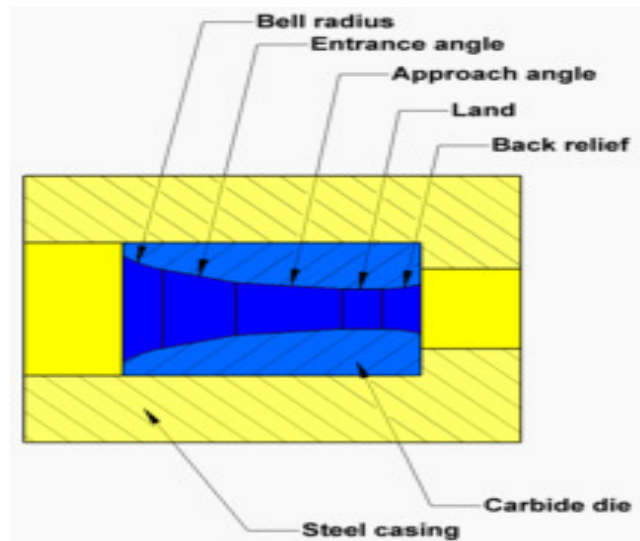


Fig. 2 Drawing Die

Wire Drawing

Wire drawing is a metal-reducing process in which a wire rod is pulled or drawn through a single die or a series of continuous dies, thereby reducing its diameter. Because the volume of the wire remains the same, the length of the wire changes according to its new diameter. Various wire *tempers* can be produced by a series of drawing and annealing operations. (*Temper* refers to toughness.) The process of wire drawing involves the production of wire of close diameter and tolerance by drawing descaled hot-rolled rod through a die. The finished wire is coiled onto a motor driven block. The dies are manufactured from hard material e.g tungsten carbide. Diamonds dies are used for small diameter wire. Soap is used for lubrication. If large diameter reductions are required the rod is progressively drawn through several stages of dies and blocks. Wire can be extruded at speeds of up to 2000 m/min.

Wire drawing is primarily the same as bar drawing except that it involves smaller - diameter material that can be coiled. It is generally performed as a continuous operation on draw bench like the one shown in Fig. 3. The rotating draw block provides a continuous pull on the incoming wire.

Large coil of hot rolled material of nearly 10 mm diameter is taken and subjected to preparation treatment before the actual drawing process. The preparation treatment for steel wire consists of,

- Cleaning. This may be done by acid pickling, rinsing, and drying. Or, it may be done by mechanical flexing.
- Neutralization. Any remaining acid on the raw material is neutralized by immersing it in a lime bath. The corrosion protected material is also given a thin layer of lubricant.

To begin the drawing process, one end of coil is reduced in cross section upto some length and fed through the drawing die, and gripped. A wire drawing die is generally made of tungsten carbide and has the configuration shown in Fig. 4 for drawing very fine wire, diamond die is preferred.

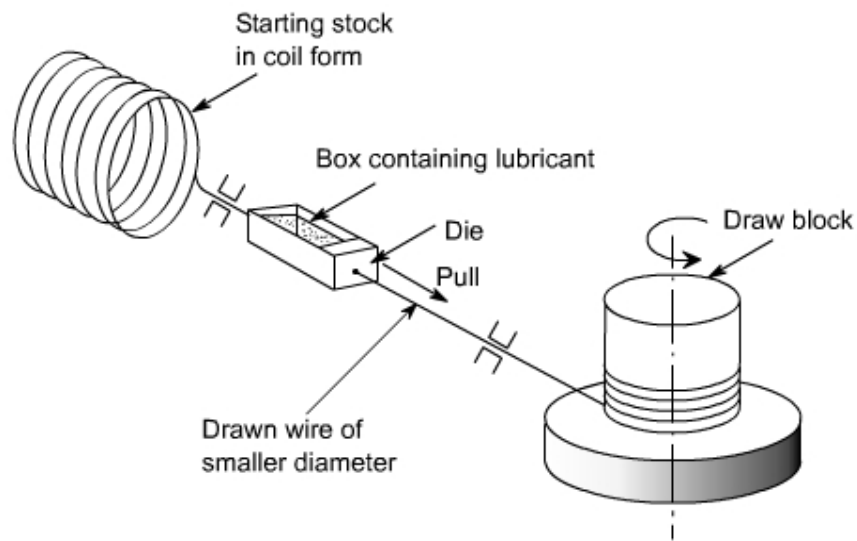


Fig. 3 Wire drawing on a continuous draw block

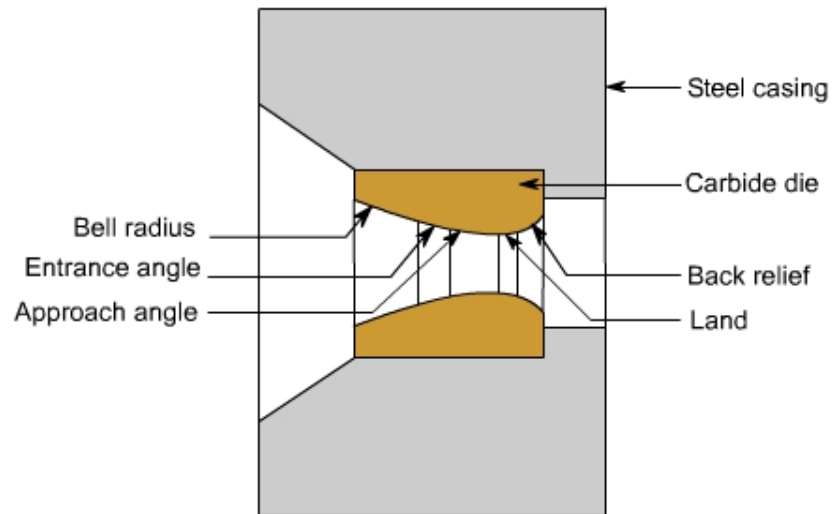


Fig. 4 Cross section through a typical carbide wire drawing die

Small diameter wire is generally drawn on tandom machine which consists of a series of dies, each held in a water cooled die block. Each die reduces the cross section by a small amount so as to avoid excessive strain in the wire. Intermediate annealing of material between different states of wire may also be done, if required.

Source : http://elearningatria.files.wordpress.com/2013/10/unit_5_drawing-notes.pdf