

## About Aggregates - Terminology

### What is Metalworking?

Metalworking is a process in which a metal shape is modified by a material removal process. There are four types of processing for which an Aggregate Head or Live Tool can be used:

### Milling

Milling is the complex shaping of metal (or possibly other materials) parts, by removing unneeded material to form the final shape. It is generally done on a *milling machine*, a power-driven machine that in its basic form is comprised of a milling cutter that rotates about the spindle axis (like a drill), and a worktable that can move in multiple directions (usually three dimensions [x,y,z axis] relative to the workpiece, whereas a drill can only move in one dimension [z axis] while cutting). The motion across the surface of the workpiece is usually accomplished by moving the table on which the workpiece is mounted, in the x and y directions. Milling machines may be operated manually or under computer numerical control (CNC), and can perform a vast number of complex operations, such as slot cutting, planing, drilling and threading, rabbeting, routing, etc. Two common types of millers are the horizontal miller and vertical miller.

### Turning

A *lathe* is a machine tool which spins a block of material so that when abrasive, cutting, or deformation tools are applied to the workpiece, it can be shaped to produce an object which has rotational symmetry about an axis of rotation, called Solids of Revolution. Examples of objects that can be produced on a lathe include candlestick holders, table legs, bowls, baseball bats, crankshafts or camshafts.

The material may be held in place by a chuck or worked between one or two centers of which at least one can be moved horizontally to accommodate varying material lengths. In a metalworking lathe, metal is removed from the workpiece using a hardened cutting tool which is usually fixed to a solid moveable mounting called the "toolpost", this arrangement is then moved around the workpiece using handwheels and/or computer controlled motors. The main difference between the Milling Machine and the Lathe is that in the Milling Machine the tool is moving but in the Lathe, the work is moving. Modern CNC lathes can do secondary operations like milling in X,Y,Z direction by using *driven tools*, also called *live tools*. When driven tools are used the work piece stops rotating and the driven tool executes the machining operation with a rotating cutting tool. *Live tools increase machining performance* as all operations can be made in one set up in the CNC lathe.

### Cutting

There are many technologies available to cut metal. Sawing, chisel, shearing, burning by Laser, gas jet and plasma, erosion by water jet or electric discharge, and good old fashioned hand cutting. Cutting fluid or coolant are introduced by a spray across the face of the tool and piece to decrease the temperature caused by friction and to prevent tool point weld.

### Drilling and Threading

Drilling is the process of using a drill bit in a drill to produce holes. Under normal usage, swarf is carried up and away from the tip of the drill bit by the fluting. The continued production of chips from the cutting edges pushes the older chips outwards from the hole. This continues until the chips pack too tightly, either because of deeper than normal holes or insufficient backing off (removing the drill slightly [breaking the chip] or totally from the hole [clearing the bit] while drilling). Lubricants (or coolants) (i.e. cutting fluid) are sometimes used to ease this problem and to prolong the tool's life by cooling, lubricating the tip and improving chip flow.

Taps and dies are tools commonly used for the cutting of screw threads in metal parts. A tap is used to cut a female thread on the inside surface of a predrilled hole, while a die cuts a male thread on a preformed cylindrical rod.