Woodturning - part 1

The art of woodturning is a process which has had a place in both the commercial and hobbyist market for a great many years. It has also been a key topic covered within the Technology curriculum whether it be at SQA qualification level or within the broad general education levels.

Woodturning is used in various forms in making furniture and furniture parts, building trim, tool parts, toys, athletics apparatus, and many other useful and beautiful articles in common use.

To assist in the knowledge of basic woodturning techniques, we have been working at SSERC to put in place a 2-day woodturning course for teachers and technicians. Over the last year, the Technology team have created a new workshop area, refurbished and installed 5 woodturning lathes complete with extraction and new tooling. We will be running this new course in June, for further information and to apply for a space, check out our website under the Technology PL link. In the meantime, we have put together a series of short articles as a guide covering the equipment, safety, tools, and processes used in woodturning. We will look at each area in turn over the next few bulletins.

Woodturning lathe

A woodturning lathe is a machine that holds and rotates timber against handheld cutting tools to produce cylindrical or moulded shapes. The main parts of the lathe can be found in Figure 1 with an outline description below. The size of any lathe is specified by the two main factors that determine its capability; the maximum distance between the centres and the height of the spindle centre above the lathe bed.

Figure 1

Bed

The bed of the lathe is made from cast iron and it supports the headstock, tailstock, tool rest and various accessories. The bed is accurately machined on its top and side surfaces and bolted to the headstock and stand.

Headstock

The headstock, made from cast iron, contains the motor, switching, speed pulleys and driving mandrel to which faceplates or other attachments can be screwed or morse taper attachments housed. On older style lathes such as in figure one, the speed of the mandrel is determined through a pulley setup. In this case a set of pulleys, which allow four different spindle speeds of 425, 800, 1400 and 2300 (rev/min). In newer machines now found in some schools, the speed is controlled via a Variable Frequency Inverter. This does give a few benefits to the user such as more incremental control of speed and soft starting and stopping. Generally, the larger the diameter of wood being turned, the slower the speed required. For example, up to 50 mm diameter use 1400-2300 rev/min; 50 to 100 mm diameter use 800-1400 rev/min.

Tailstock

The tailstock is made from cast iron and is machined to fit the bed of the lathe. It serves two functions (1) to support the material being turned via a cone shaped centre and (2) to allow drilling holes in material either using a tapered shanked drill fitted to into the spindle or using a hollow centre to allow a drill to be passed through.

The tailstock is designed to move along the length of the bed and locked into any position. The handwheel allows for final adjustment with a locking screw to retain in position.

Tool rest

The tool rest is made up of two parts, the main body which goes across the bed of the lathe and the tee rests which fit into the main body. These 2 component parts when assembled allow for adjustment in four directions. It can be moved along the length of the bed and locked in any position, the height can be adjusted up or down and at any angle to suit the various cutting tools being used.

Types of woodturning

Face plate

Articles such as bowls, circular bread boards, bases for lamp stands etc. are turned using face plates. The material being turned is attached to a face plate and the face plate is then attached to the headstock via the threaded end of the spindle. There are numerous types of face plates available and ways to mount the material being turned on the headstock spindle. More details of this will be given in future articles. Please see Figure 2.

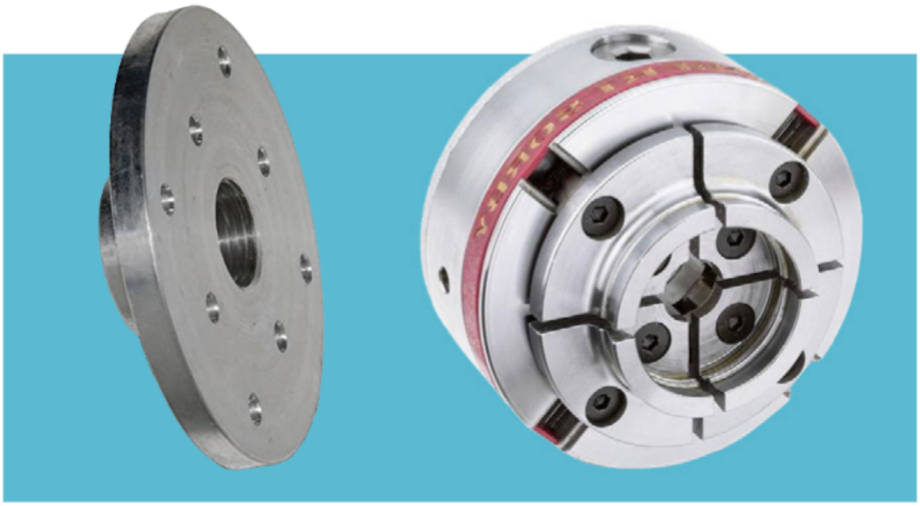

Figure 2 - Typical face plate and lathe chuck.

Turning between centres

Turning between centres, or spindle turning, is almost self-explanatory. The work to be turned (often called the stock) is fitted between the headstock and the tailstock. Table lampstands, rolling pins, stool and table legs are some examples of turning between centres. Most of these turned shapes are formed by the paring action of turning gouges and chisels. Figure 3 show the basic stages in preparing a piece of material for turning between centres.

Safety in woodturning

Safety, as with all activities undertaken in the workshop is paramount. As outlined in BS 4163, the following must be followed specifically to woodturning;

- The main controls for setting the machine on and off should be via a starter switch that has both overload protection and have a no volt release feature.
- The machine should be provided with a means of electrical isolation using a fused isolating switch which should be in the 'off' position before setting up the lathe. The main controls for setting the machine on and off should be via a starter switch that has both overload protection and have a no volt release feature.
- An emergency stop switch should be positioned so that it is readily accessible. Any guarding to the motor, pulley, spindle shafts and electrics should be locked and any access allowable with the use of a tool. Interlocking switches are also advisable.
- There should be enough clear space around the lathe to prevent the user being accidentally pushed by passers-by.
- The floor surface should not be slippery and should be kept free of loose items and wood shavings.
- Only one person at a time should operate the machine.
- Suitable eye protection must be used while operating the machine. Substantial footwear should be worn.

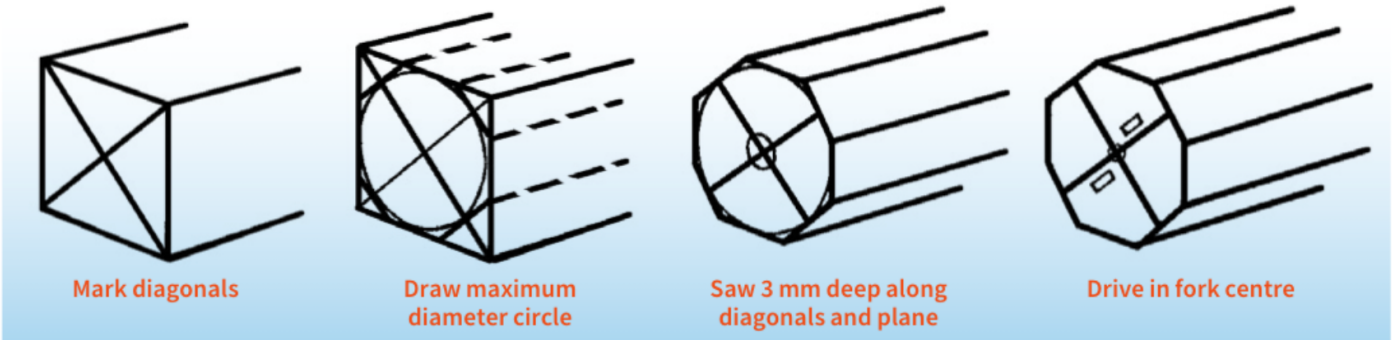

Figure 3

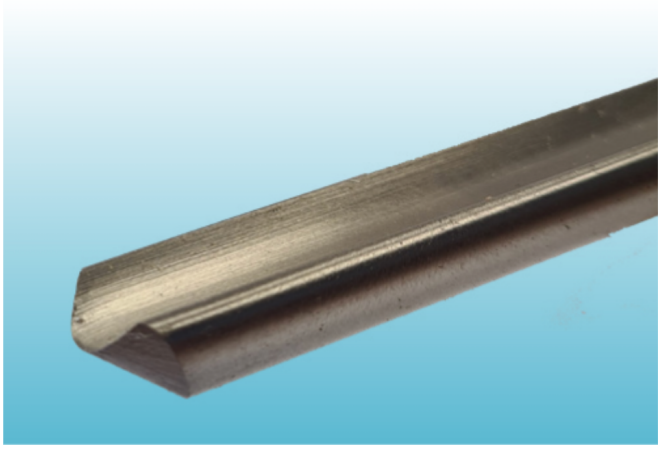

Figure 4 - Roughing gouge.

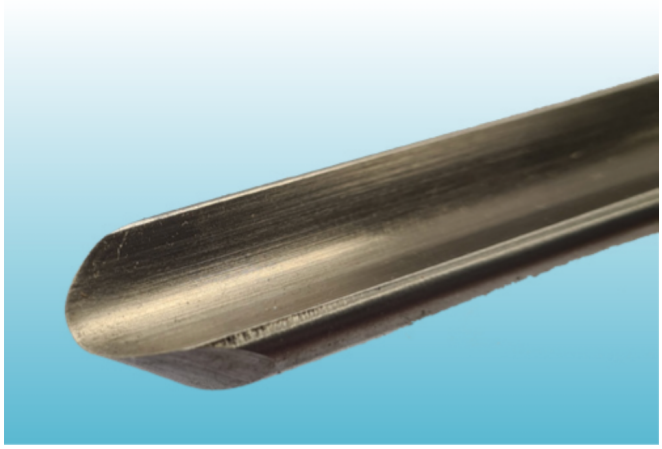

Figure 5 - Bowl gouge.

- Long hair, loose clothing and jewellery should be secured/ removed to prevent it from coming into contact with moving parts
- Gloves should not be worn while operating the lathe due to the high risk of potential entrapping of fingers.
- Timber should be inspected carefully to ensure it is free from any defects and it should be prepared in a roughly circular or octagonal shape before commencing machining operations. Segmented material should not be turned. If jointed material is used (e.g. in pattern making), it should be turned under close supervision.
- Work mounted to a faceplate, a chuck or between centres should be properly secured and balanced to prevent excessive vibration.
- Ensure that the tool rest is locked and is as close as possible and parallel to material being turned. ie. stock must not foul the tool rest.
- Only one side of the headstock should be used at one time with the other end protected.
- The lathe should be isolated before speeds are changed. A safe turning speed is important and should be appropriate for the type, diameter and condition of material.
- Woodturning tools must be held securely, at the correct cutting angle, stored safely and kept in good order. Under no circumstances should improvised tools be made or used.
- All measuring, gauging or adjustments must be made with the machine stopped.
- Dust must be controlled or prevented – When effective LEV is not in place, a dust mask conforming to BS EN 149:2001+A1:2009 class FFP3 must be used.

Woodturning tools

Lathe tools can be classified under three headings; cutting tools, scraping tools and boring tools. Turning tool handles are longer than the bench chisel and gouge handles. They are shaped to give a comfortable grip and give sufficient leverage to counteract the action of the revolving timber on the tool. Here, we will look at some of the common tools used in turn.

Tools for cutting

Gouges

Gouges of the standard pattern are made in sizes ranging from 6 mm to 25 mm. Gouges are, in the main, used for roughing work, although very fine work can be carried out with the gouge when used correctly. For turning between centres roughly to size, a 25 mm gouge with a cutting edge of 45 degrees ground square across is recommended (see Figure 4).

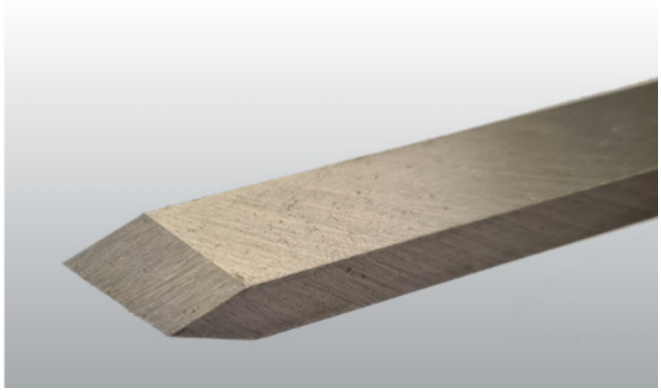

Figure 6 - Skew Chisel.

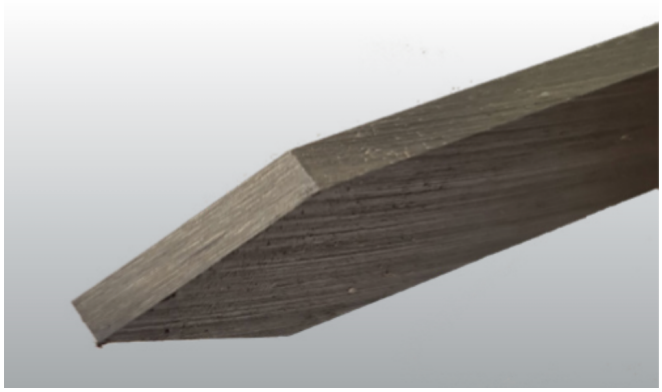

Figure 7 - Parting Chisel.

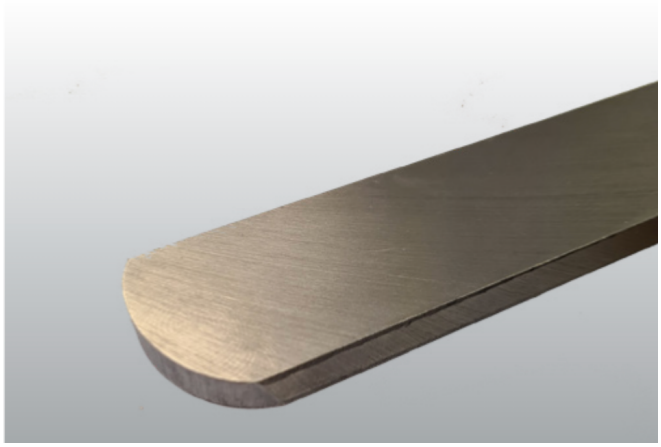

Figure 8 - Round nose scraper.

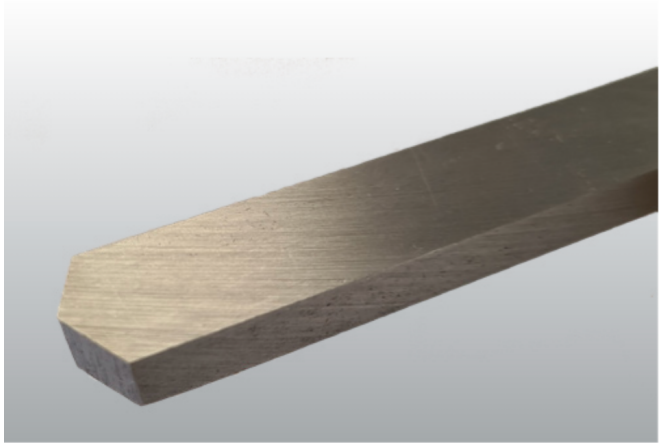

Figure 9 - Diamond point scraper.

For bowl turning, the gouge must be shaped like the end of a finger, i.e. the corners ground well back to an angle of 50-55 degrees. Like the bowl gouge (see Figure 5), the spindle gouge is shaped in the same way though the grinding angles differ – they should be ground to 35 degrees.

Chisels
Chisels are obtainable in sizes ranging from 13 mm to 25 mm and are ground on both sides. The cutting edge itself is either skewed (see Figure 6) or squared. Skew chisels are used for smoothing spindle turnings, for cutting beads and as a cutting tool is most useful for softwood turning where a scraping action would tear out the fibres of the wood. The edge should be ground to 60 degrees. Parting chisels are made in one size only. They are designed for parting off the finished job or for cutting grooves when marking out. The grinding angle for parting tools should be 25 degrees (see Figure 7).

Tools for scraping

This group of tools are those which have a scraping action. These tools are generally used for turning very hard woods. Though they produce very satisfactory results in turning hardwood generally, they are particularly suitable for use within the school workshop as they require less skill than cutting tools. They are ground on one side only and available in round nose and diamond point shapes, standard widths include 13, 19 and 25 mm (see Figure 8 and 9). Scrapers are ground to an angle of 80 degrees, with a tiny burr being raised on its top face.

Tools for boring

General purpose drilling can be done on the lathe using normal twist drills (held in a suitable chuck) or using taper shank drills fitted straight into the tailstock spindle. For boring larger holes, a Forstner bit is ideal.

It can produce a clean hole with a smooth base. These are available in many sizes ranging from 6 mm to 50+ mm. To bore long holes, down the length of a spindle such as when turning table and standard lamps a Shell Auger can be used conjunction with a hollow centre fitted the tailstock (see Figure 10).

In part 2, we will look at attachments for the lathe such as centres, face plates and chucks, as well as techniques how to use some of the common tools.

Figure 10 - Selection of boring tools.