TECHNICAL HANDOUT

MACHINE TOOLS LEVEL 2

BLACKHORSE WORKSHOP

INTRODUCTION

Machine-tools are designed to aid the efficient and accurate production of multiple timber components, and are therefore essential when working commercially with wood, where speed and precision are crucial. The equipment covered in this induction will enable you to accurately machine timber to size, whether it be sheet materials or solid timber.

Accidents involving contact with dangerous parts of machinery account for half of all major injury accidents. The risks with the use of woodworking machinery in particular are high since they rely upon high-speed sharp cutters which will always be partly exposed to allow the machining process to take place.

The table saw and surface planer in particular are high-risk machines, due to the fact that they are hand-fed, meaning that the hands of the operator are constantly exposed to danger. The level 2 induction serves not only as a 'training session' to reduce the risks of injury in your use of these machines, but also provides an insight into the process of machining timber to your required dimensions.

This handout gives a brief definition of the three machines introduced during the level 2 induction, accompanied by some key safety tips to help you work safely with these in the workshop.

THE SURFACE PLANER

The Surface Planer and Thicknesser are used to plane accurate smooth surfaces on four sides of your timber. You are likely to need to do this when you have purchased 'sawn' timber from a supplier, or simply need to reduce pre-planed timber or board materials down to your required measurements.

A production machine shop will often be equipped with separate machines: a surface planer for machining the face side and edge on a work piece, and a thicknesser for planing the remaining surfaces parallel. However, for hobby or occasional usage (where space and budget may be limited), a combination planer/thicknesser machine will usually suffice.

KEY FEATURES OF MACHINE:

- → Motor & drive system
- → Cutter block & knives (width: 300mm)
- → Switch & isolator
- → Table lengths – infeed/outfeed / depth adjustment
- → Fence adjustment & setting
- → Guard adjustment and positioning

MOST COMMON USES:

- → Planing a flat 'face side' and 'face edge' on 'sawn' or oversize timber materials
- → Planing a straight edge on sheet materials
- → Planing angles or chamfers (less frequently used for this)

THE SURFACE PLANER

SURFACE PLANER SAFETY TIPS:

SET-UP:

- → Never use a planer with a missing or damaged bridge guard. Cutters revolve at very high speed (100 cuts per second) and can sever a finger in a fraction of a second
- → Always isolate machine from the power supply before making any adjustments to the guard or fence
- → Face side set-up: guard height should be adjusted as close to highest point of work piece as possible and slid fully up to the fence
- → Face edge set-up: guard should be lowered down to the bed and slid way from the fence just enough to allow the work piece to pass between the fence and end of guard. For accuracy, ensure the bed and fence are adjusted to exactly 90 degrees.
- → Check guard locks are securely tightened before start-up.
- → Adjust infeed table height correctly. Max 2-3mm cut (narrow material) or 1-2mm on wider boards.
- → Check timber for nails, screws, loose knots or foreign materials before machining
- → Ensure extension tables, additional supports or a second person are present to assist with handling long or heavy timbers.

DURING USE:

- → Keep fingers at least 100mm away from the moving cutter block at all times.
- → Hands should NEVER be directly above the exposed cutter during operation
- → During use, position yourself so as to shift your weight from the infeed to the outfeed table as the work piece passes over the cutter, transferring hands to apply pressure to the work piece
- → Remove scarves, jewellery, tie back long hair and any loose clothing before use
- → No headphones (for music) to be worn while operating machinery
- → Always wear eye/ear protection and safety footwear during use
- → Check for bowing or twisting of work piece – concave face should be face-down on the bed
- → Check grain direction: grain should slope forward at an angle over the cutters to reduce risk of kickback or breakout on timber
- → No sheet materials (MDF, ply etc) should be machined on the flat as these quickly blunt the cutters. However, planing straight edges on board materials is fine to do, having less impact upon the cutters
- → Always ensure extraction unit is turned on and planer gate open before use
- → Use a push block to pass small or thin work pieces over the cutters
- → Never pass wood less than 10mm in thickness or 300mm length over the cutters
- → Apply only minimal downward pressure on thinner concave work pieces as they pass over the cutters
- → Keep work piece moving and don't reverse timber away from cutter during use

THE TABLE SAW

Table-saws are in principle a basic machine, comprising a circular saw blade which protrudes up through a slot in the centre of a flat worktable. This is turned by a powerful motor and drive system, which is mounted beneath the machine. Fitted with fences and guards, the machine is used to cut down solid timber and board materials to size. Table saws are also known as panel saws, dimension saws, rip saws and mobile site saw-benches and vary in design and size depending upon their intended use.

Circular saws (including chopsaws) are the cause of most woodworking accidents – mostly resulting in the amputation of fingers. Health and Safety analysis found that most accidents were caused by inadequate, incorrectly adjusted or missing blade guards. Lack of training and failure to use a push stick where necessary were also a key cause of accidents. Kickback of the work piece on a table saw has caused serious and even fatal accidents.

KEY FEATURES OF MACHINE:

- → Motor and drive system
- → Switching / emergency stops & isolator
- → Ripping timber: blade type and rip fence
- → Cross-cutting timber: blade type and crosscut fence/sliding bed
- → Blade height and angle adjustment
- → Guards: adjustment /change
- → Riving knife

MOST COMMON USES:

- → Cutting solid timber and board materials down to width and length
- → Ripping a straight edge on waney edge timber
- → Cutting precise angles on timber

THE TABLE SAW

TABLE SAW SAFETY TIPS:

SET-UP:

→ Never use a table saw with a missing or damaged blade guard. The blade revolves at a very high speed and a serious accident can occur in a fraction of a second
→ Always isolate machine from the power supply before making any adjustments to guard, stops or fences
→ Ensure machine is fitted with the correct type of blade before use. Please ask one of the Blackhorse technicians if you need a blade changed before you use the machine
→ Ensure locks on fences and stops are securely tightened before switching on
→ Ensure push sticks are within easy reach if needed before turning the machine on.
→ Ensure surrounding area is clear of hazards before using the machine
→ Ensure blade area is clear from off-cuts or thin slivers before switching on
→ Ensure blade height and/or angle are correctly adjusted before use. Blade height should be adjusted so teeth project through upper surface of the work piece
→ Guard should be kept as close to the top of the work piece as possible and should not be adjusted while the machine is running. The wider guard should be used to enclose the blade when tilted for cutting of angles
→ Riving knife: this should never be removed as its job is to reduce the risk of 'kickback'. This occurs when the blade becomes pinched inside the wood, or the wood becomes pinched between the blade and rip fence, causing the work piece to be forcibly thrown out of the machine in the direction of the user – potentially at a speed of around 103mph. Users need to be particularly careful when ripping solid timber. Riving knives should not be removed from machines to perform operations such as rebating and grooving.
→ Check the saw blade is sharp and clean before use. Blunt or resin-covered blades require increased force on the work piece from the user, increasing the chance of a kickback. They also result in poor-quality work: inaccuracy, burn marks or a rough surface finish.
→ Check timber for nails, screws, loose knots or foreign materials before machining

DURING USE:

→ Keep fingers at least 100mm away from the moving blade at all times.
→ Push-sticks: These should be used to feed the last 300mm of any cut into the blade, or to push timber between the rip fence and blade when the gap is less than 300mm. They are also useful for removing off-cuts from the blade area. Push-sticks should be 450mm long, made of solid hardwood and have an angled 'bird's mouth' to locate onto the corners of timber.
→ Hands should NEVER be directly in line with the moving blade during operation
→ Never stand directly behind a work piece when ripping timber (in case of kickback).
→ Remove scarves, jewellery, tie back long hair and any loose clothing before use
→ No headphones (for music) to be worn while operating machinery
→ Don't get distracted when using the machine – everything else can wait until you have finished the process and switched off the machine.
→ Always wear eye/ear protection and safety footwear during use
→ Check for bowing or twisting of work piece – work piece should be kept flat to the bed at the point of cutting, so bowed timber should be cut with concave surfaces face-up on the machine.
→ Ensure extension tables, additional supports or a second person are present to assist with handling board materials or long/heavy timbers
→ Never start a blade whilst still within a piece of timber. If a blade pinches or the work piece becomes stuck, immediately turn off machine and remove work piece when the blade has stopped turning
→ Always ensure extraction unit is turned on and table saw gate is open before use
→ No work pieces of less than 300mm in length should be cut on the table saw

THE THICKNESSER

The Thicknesser is used to plane accurate smooth surfaces on the remaining two faces of your timber (opposite the face side and edge previously machined on the surface planer). It is also useful for reducing the thickness of material that is already machined and for flattening wider surfaces on boards made from two or more glued-up components – e.g. solid table tops.

It is essential for your work piece to already have one pre-planed flat surface in order for the thicknesser to do its job accurately

KEY FEATURES OF MACHINE:

- → Motor & drive system
- → Cutter block & cutters (width: 500mm)
- → Infeed & outfeed rollers / anti-kickback teeth
- → Feed rollers speed adjustment
- → Switching & isolator
- → Bed height adjustment
- → Devices: taper/chamfer jigs/baseboard

MOST COMMON USES:

- → Planing accurate remaining faces on timber (opposite face side and edge)
- → Reducing pre-machined timber to thickness
- → Planing tapers or chamfers on timber (with use of a jig)
- → Flattening wider glued-up work pieces

THE THICKNESSER

THICKNESSER SAFETY TIPS:

SET-UP:

- → Adjust height of the bed appropriate to thickness of material you are passing through the machine. This should relate to the highest point or thickest part of your work piece where the material is irregular. Max cut 2-3 mm on narrow work pieces, 1-2mm on wider timber. Heavier cuts than this will overload the motor and damage the machine.
- → Examine timber prior to machining for loose knots, nails, screws etc. These can easily cause damage to the machine and the cutters.
- → Ensure your pre-planed face or edge is sitting face-down on the bed (for accuracy)
- → Ensure extension tables, additional supports or a second person are present to assist with handling long or heavy timbers.
- → Ensure there is sufficient clearance for long work pieces (3-4m) to enter and exit the machine before starting work.
- → Ensure feed rollers are set to the correct speed before use – i.e. on a low setting unless you have to process a large quantity of long narrow work pieces.

DURING USE:

- → Ensure extraction unit is turned on and thicknesser gate is open before using the machine
- → Ensure bed is free of shavings before inserting timber. Waste trapped between the bed and your timber can result in inaccuracies.
- → Never pass wood less than 300mm in length through the machine
- → No sheet materials (MDF, ply etc) should be passed through the thicknesser as this will quickly blunt the cutters.
- → Rough sawn or irregular timber should not be put directly through the thicknesser unless you have previously planed a flat face on the underside of the work piece using the surface planer. (the thicknesser depends upon this for accuracy of the new faces it is machining)
- → Hands should NEVER be put inside the machine during operation to push through/retrieve a work piece or clear shavings. Fingers or clothing can become trapped in the feed rollers, which will pull you into the machine. If possible, use a push-stick or offcut to push through or free any work pieces stuck inside the machine.
- → Do not stand directly behind a work piece once the feed rollers have taken the timber, in case of kickback.
- → Use a wooden baseboard for any machining below 5mm in thickness (min thickness achievable with this method: 2.5mm)
- → If a work piece becomes stuck inside the machine (and cannot be resolved using other means), turn off the machine and lower the bed before removing your timber.
- → Remove scarves, jewellery, tie back long hair and any loose clothing before use
- → No headphones (for music) should be worn while operating machinery
- → Always wear eye/ear protection and safety footwear during use
- → Check grain direction: grain should slope down towards the bed to reduce breakout and obtain the best finish on timber

DUST EXTRACTION SYSTEM

The extraction unit is connected to all large equipment in the machine shop and must be used at all times in your use of this equipment. Its purpose is to extract all wood waste from the machines and deposit this into the collector bins, which are frequently emptied for disposal. The unit is essential for extracting the large volumes of waste produced by planing and thicknessing, but also to prevent the finer dusts produced by saws and sanders from become airborne. Regular maintenance of the unit is fundamental to ensure the workshop is kept as a clean and healthy environment in which to work.

KEY FEATURES OF SYSTEM:

→ Motor & extraction unit
→ On/Off switch position
→ Gates and ducting

EXTRACTOR TIPS DURING USE:

→ Ensure extraction unit is turned on for ALL machine use. Even small components and quick tasks produce dust, hence the need for the system to be used for all work being undertaken in the machine shop.
→ Ensure unit is not full before use: if shavings are seen to obscure the entire clear window cut into the side of Bin 2, the unit will need emptying before any further use. Technicians empty the bins at the end of the day, but significant amounts of planing or thicknessing can quickly fill the bins before this. In this case, we ask members to take responsibility for emptying the bins themselves. If you are unsure how to do this, please ask another member or technician to show you how.
→ In conjunction with turning the unit on, it is necessary to ensure the gate on the machine you are using is open. The gates on the planer and thicknesser in particular should be opened and closed before and after each use of these machines.
→ Production of excessive dust or build-up of shavings on machine beds during use suggests the unit is full or a duct has become blocked. Please ask a technician to resolve any issues that arise.
→ Ear protection is essential due to the noise produced by the extraction unit during use.