PENANG SANGAM HIGH SCHOOL
P.O.BOX 44, RAKIRAKI

WEEK 22 WORKSHEET

Subject: Applied Technology **Year/Level:** 13

Strand: 5	**AT 13.5: Machines And Engines**
Sub Strand	**AT 13.5.1** Motorized Machines And Engines
Content Learning Outcome	**AT 13.5.1.1** Demonstrate knowledge of the use of motorized Static machines.

LESSON NOTES

Chapter 5: Motorized status machines

Scroll Saw - This machinery is very similar to jigsaws and band saws only they are used for cutting much smaller and thin pieces of timber that are too hard or difficult to cut with a band saw or jigsaw.

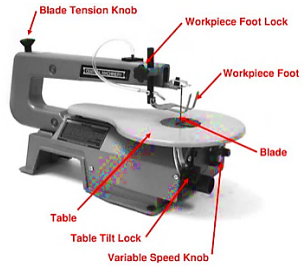


Table Saw - Table saws are one of the most versatile and useful pieces of machinery used in woodwork because they can cut large pieces of timber or manufactured boards with ease. Table saws can also cut angles and they are able to trim or square off the ends of timber.

Thicknesser - A thicknesser is used to smooth rough timber or reduce its thickness.

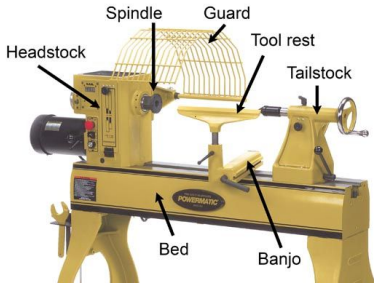
Parts it consists of:

A thicknesser works with two rollers that feed the timber into the blades and then push it out after it has been thicknessed.

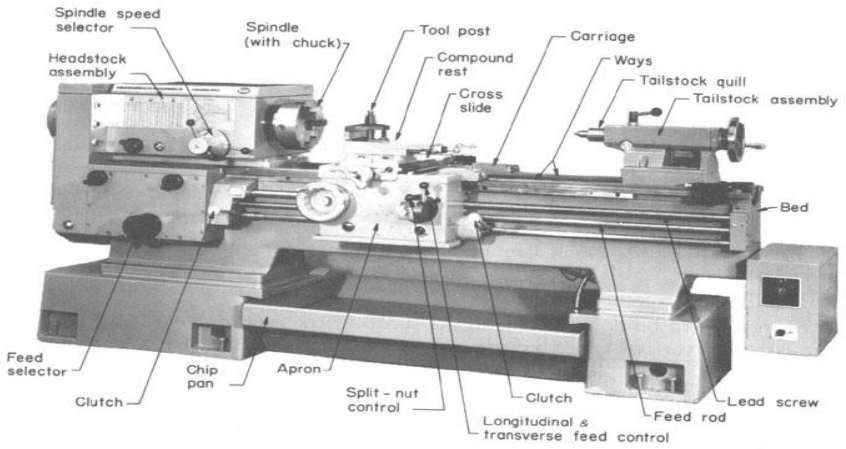
In the middle of this machinery is a height adjustable set of blades which are used to remove certain amounts of timber depending on the adjustment settings of the machine.

Woodworking lathes - Woodworking lathes are the oldest variety. All other varieties are descended from these simple lathes. An adjustable horizontal metal rail – the tool rest – between the material and the operator accommodates the positioning of shaping tools, which are usually hand-held. After shaping, it is common practice to press and slide sandpaper against the still-spinning object to smooth the surface made with the metal shaping tools. The tool rest is usually removed

during sanding, as it may be unsafe to have the operator's hands between it and the spinning wood. Many woodworking lathes can also be used for making bowls and plates.



Metal lathe - In a metalworking lathe, metal is removed from the work piece using a hardened cutting tool, which is usually fixed to a solid moveable mounting, either a tool-post or a turret, which is then moved against the work piece using hand wheels and/or computer-controlled motors. These cutting tools come in a wide range of sizes and shapes, depending upon their application. Some common styles are diamond, round, square and triangular.



Explanation of the standard components of most lathes:

Bed: Usually made of cast iron. Provides a heavy rigid frame on which all the main components are mounted.

Ways: Inner and outer guide rails that are precision machined parallel to assure accuracy of movement.

Headstock: mounted in a fixed position on the inner ways, usually at the left end. Using a chuck, it rotates the work.

Gearbox: inside the headstock, providing multiple speeds with a geometric ratio by moving levers.

Spindle: Hole through the headstock to which bar stock can be fed, which allows shafts that are up to 2 times the length between lathe centers to be worked on one end at a time.

Chuck: 3-jaw (self-centering) or 4-jaw (independent) to clamp part being machined. **Chuck:** allows the mounting of difficult work pieces that are not round, square or triangular.

Tailstock: Fits on the inner ways of the bed and can slide towards any position the headstock to fit the length of the work piece. An optional taper turning attachment would be mounted to it.

Tailstock Quill: Has a Morse taper to hold a lathe center, drill bit or other tool.

Carriage: Moves on the outer ways. Used for mounting and moving most the cutting tools.

Cross Slide: Mounted on the traverse slide of the carriage, and uses a hand wheel to feed tools into the work piece.

Tool Post: To mount tool holders in which the cutting bits are clamped.

Compound Rest: Mounted to the cross slide, it pivots around the tool post.

Apron: Attached to the front of the carriage, it has the mechanism and controls for moving the carriage and cross slide.

Feed Rod: Has a keyway, with two reversing pinion gears, either of which can be meshed with the mating bevel gear to forward or reverse the carriage using a clutch.

Lead Screw: For cutting threads.

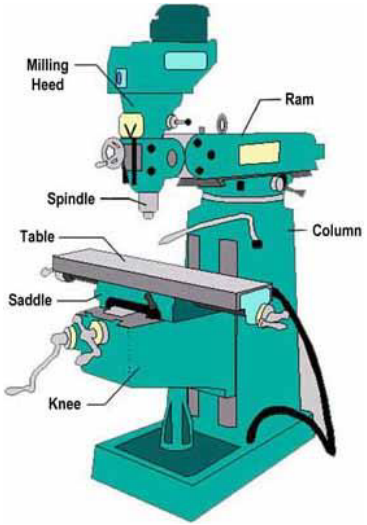
Split Nut: When closed around the lead screw, the carriage is driven along by direct drive without using a clutch.

Quick Change Gearbox: Controls the movement of the carriage using levers.

Steady Rest: Clamped to the lathe ways, it uses adjustable fingers to contact the work piece and align it. Can be used in place of tailstock or in the middle to support long or unstable parts being machined.

Follow Rest: Bolted to the lathe carriage, it uses adjustable fingers to bear against the work piece opposite the cutting tool to prevent deflection.

Vertical Milling Machines - Milling is a process performed with a machine in which the cutters rotate to remove the material from the work piece present in the direction of the angle with the tool axis. With the help of the milling machines one can perform many operations and functions starting from small objects to large ones.



Milling machining is one of the very common manufacturing processes used in machinery shops and industries to manufacture high precision products and parts in different shapes and sizes.

Milling Machine - The milling machines are also known as the multi-tasking machines (MTMs) which are multi-purpose machines capable of milling and turning the materials as well.

Milling Process - The milling machine involves the following processes or phases of cutting:

Milling Cutters - The milling cutters named end mills have special cutting surfaces on their end surfaces so that they can be placed onto the work piece by drilling. These also have extended cutting surfaces on each side for the purpose of peripheral milling. The milling cutters have small cutters at the end corners. The cutters are made from highly resistant materials that are durable and produce less friction.

Surface Finish - Any material put through the cutting area of the milling machine gets regular intervals. The side cutters have got regular ridges on them. The distance between the ridges depends on the feed rate, the diameter of the cutter and the quantity of cutting surfaces. These can be the significant variations in the height of the surfaces.

Gang Milling - This means that more than two milling cutters are involved in a setup like the horizontal milling. All the cutters perform a uniform operation or it may also be possible that the cutter may perform distinct operations. This is an important operation for producing duplicate parts.

Types of Milling Machines

Vertical Milling Machines -The vertical mill has a vertically arranged spindle axis and rotates by staying at the same axis. The spindle can also be extended and performing functions such as drilling and cutting. Vertical mill has got two further categories as well: turret mill and bed

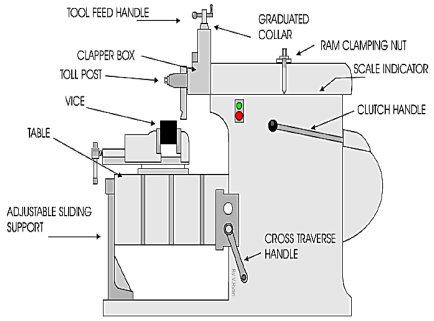
mill. The turret mill has got a table that moves perpendicularly and parallel to the spindle axis in order to cut the material. The spindle is, however, stationary. Two cutting methods can be performed with this by moving the knee and by lowering or raising the quill.

The other is the bed mill in which the table moves perpendicular to the axis of the spindle and the spindle moves parallel to its axis.

Horizontal Milling Machines - The horizontal mill is also the similar cutter but their cutters are placed on a horizontal arbor. A lot of horizontal mills have got rotary tables that help in milling in various angles. These tables are called the universal tables. Apart from this all the tools that are used in a vertical mill can also be used in the horizontal mill.

Shaping Machine - A shaping machine is used to machine surfaces. It can cut curves, angles and many other shapes.

The main parts are indicated below:



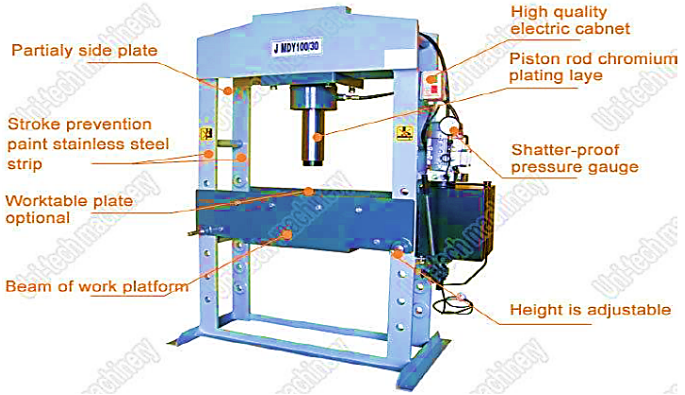
Hydraulic Press

A hydraulic press is a device (see machine press) using a hydraulic cylinder to generate a compressive force. It uses the hydraulic equivalent of a mechanical lever, and was also known as a Bramah press after the inventor, Joseph Bramah, of England.[1] He invented and was issued a patent on this press in 1795. As Bramah (who is also known for his development of the flush toilet) installed toilets, he studied the existing literature on the motion of fluids and put this knowledge into the development of the press

The hydraulic press depends on Pascal's principle: the pressure throughout a closed system is constant. One part of the system is a piston acting as a pump, with modest mechanical force acting on a small cross-sectional area; the other part is a piston with a larger area which generates a correspondingly large mechanical force. Only small -diameter tubing (which more easily resists pressure) is needed if the pump is separated from the press cylinder.

Pascal's law: Pressure on a confined fluid is transmitted undiminished and acts with equal force on equal areas and at 90 degrees to the container wall.

Application - Hydraulic presses are commonly used for forging, clinching, moulding, blanking, punching, deep drawing, and metal forming operations.



STUDENT ACTIVITY

1. Identify the uses of **Woodworking lathe.**

2. Differentiate between **Vertical Milling Machines** and **Horizontal Milling Machine.**

3. Identify hydraulic press depends on whose principle?

THE END