

Knowledge Organizer – Year 9

Product Design/Engineering

Plastics:

There are 2 main categories of plastics (or polymers)

- **Thermoplastics:** Can be re-melted and recycled easily, are usually easy to work with.
 - Eg: Acrylic
- **Thermosetting plastics:** Cannot be easily melted, often have high melting points. Usually more difficult to work with, but are developed for specific properties or strengths
 - Eg: Polyester

Joining Engineering Materials:

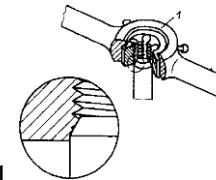
- Glues like PVA will not work on materials like metals and plastic as they are not porous enough
- **Solvent cements** will bond plastics by chemically melting their surfaces together
- **Contact adhesives** will provide a strong tacky bond between materials over large areas
- **Epoxy** is a thermosetting plastic, which works as a very strong adhesive to bond almost any material together.
- Metals can be joined using **heat** too; examples of this are **welding, soldering** and **brazing**.

Filing techniques:

- **Cross Filing:** sliding the file **across** your work piece to remove waste material and shape it
- **Draw Filing:** dragging the file **along** the work piece edge to create a smoother finish.

THREAD CUTTING:

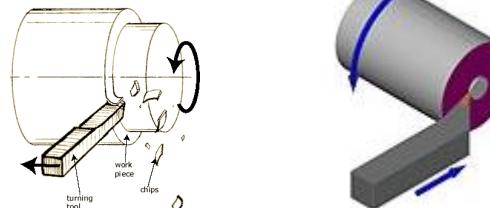
- 1) Put die in die stock
- 2) File a bevel (chamfer) on the end of the bar
- 3) Place the die on the end of the bar and push down hard
- 4) Twist clockwise 90 degrees or so, then anticlockwise 90 degrees to break off chips
- 5) Twist forward 180 degrees, then back 90 degrees again to break swarf.
- 6) Continue process until the screw thread is complete.



Counter sink	Tapping tool	Hot wire strip
Junior Hacksaw	Steel Wool	Die insert for thread cutting

TOOL TYPES

Turning processes – lathe work



Parallel turning:
Reduces work piece diameter

Facing off: cleans and squares the end of the work piece.

Sustainability/renewable resources:

Green Energy is what we call energy we get from renewable sources.

- ❖ **Photovoltaic cells** make electricity using the sun's light – they are a type of solar panel
- ❖ **Hydroelectricity** is generated by the movement of water
- ❖ **Wind turbines** convert the kinetic energy of the wind to electricity.

Materials Properties:

The properties of a metal can be manipulated using **heat**. 2 processes we can use for this are:

- **Tempering:** removes the brittleness from a metal once it has been hardened
- **Annealing:** this process reduces the hardness of a metal and can increase ductility. This makes the metal easier to work with, cut and shape.

KEY WORD FOCUS:

Welding	Tempering
Tapping	Facing off
Malleable	Draw filing
Obsolescence	Abrasion
Emery Cloth	Vacuum forming

You should be able to spell and explain the meaning of each of these terms by the end of this rotation.