

Knowledge Organiser: KS4 Design Technology – Timbers Project

What is this project about?

In this project you will be learning about timbers and boards. You will learn about the different types of timbers & boards alongside sourcing, commercial manufacturing, sustainability, joints, finishes & stock forms. You will spend your practical lessons developing your wood working skills alongside joinery techniques and the application of wood finishes for wooden products. You will be assessed on your practical work and use your theory work to embed your knowledge ready for your exam.

Timbers & Boards



Timber comes from trees. Timber refers to sawn chunks of solid wood that comes from natural growing trees, these **natural timbers** come from either hardwood or softwood trees. Leftover or recycled pieces of this timber can then be used to make a variety of different **manufactured boards**.



Hardwoods



Hardwoods are from deciduous trees, which are usually a broad-leaved tree that drops its leaves in the winter. Hardwood trees take between 80 - 120 years to grow to maturity. Examples of hardwoods include oak, mahogany and beech.

Softwoods



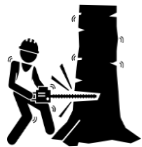
Softwoods are from coniferous trees, these usually bear needles & cones. These are frequently called evergreen trees as they do not lose their leaves. Softwoods trees take around 25 years to grow fully. Examples of softwoods include pine, spruce & larch.

Manufactured Boards



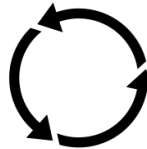
Manufactured boards are man-made timber boards, created from recycled wood & adhesives which are then pressed into a board. Examples of manufactured boards include plywood, chipboard & medium density fibreboard (MDF).

Sourcing



The source of timber is trees. Timber is cut down in a process called '**felling**'. The felled tree is then **transported** to a sawmill, where it is cut into planks in the process called **conversion** then left to dry through a process called **seasoning**.

Sustainability



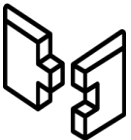
Timber is a **renewable resource**, timber can be regrown and replaced to continue the supply of material. If done sustainability timber should be an **infinite resource**. **Deforestation** impacts the sustainability of timber.

Commercial Manufacturing

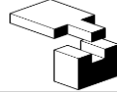


Commercial manufacturing machines used on timber are: **Milling Machines** - removes material one layer at a time to produce the desired shape :**Lathes** - for turning wood, removing layers and carving into shape

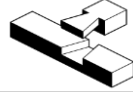
Wood Joints



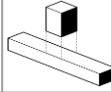
A **wood joint** is where two or more pieces of wood are joined together. Wooden joints can improve strength, rigidity, toughness alongside enhancing appearances.



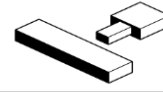
Finger Joint



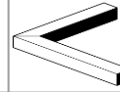
Dovetail Joint



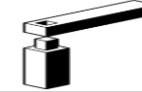
Butt Joint



Mortise & Tenon Joint



Mitre Joint



Dowelled Joint

Wood Finishes



Finishing wood refers to the process of refining or protecting a wooden surface. The **wood finish** may coat the surface forming a protective skin, make it last longer or improve its appearance.



Paint



Wax



Varnish



Stain



Oil



Wood Preservative

Stock Forms

Timber can be bought in many forms:



Planks – most common timber stock form, ranging in size and thickness. Planks can be **rough sawn** which is left rough after it's cut or **planed edge square** which is smooth



Mouldings – Strips that come in many shapes & cross sections



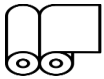
Manufactured Boards - boards ranging in size & thickness

Knowledge Organiser: KS4 Design Technology – Paper & Boards Project

What is this project about?

In this project you will be learning about paper and boards. You will learn about the different types of paper and boards alongside sourcing, commercial manufacturing, commercial processes, sustainability & stock forms. You will spend your practical lessons developing your planning & modelling skills for a card based product. You will be assessed on your practical work and use your theory work to embed your knowledge ready for your exam.

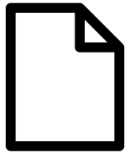
Paper & Boards



Paper consists of fine fibres that usually come from wood from trees, but hemp, flax, cotton or bamboo can also be used. Before wood from trees can be used to make paper it must be processed. Each type of paper and board has properties that make it more suited for certain tasks and for different types of products.

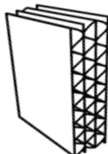


Paper



Paper is a thin sheet material produced by chemically processing cellulose fibres into sheets of pulp derived from wood. There are lots of different sorts of paper and each one is designed for a particular use and purpose.

Boards



Board is a generic term for heavy-duty paper-based products having greater thickness and superior durability to paper (it is also known as card/cardboard). Board is used in packaging due to its low cost & high strength-to-weight ratio.

Environmental Impact



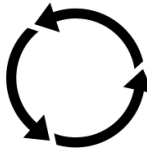
Obtaining wood for timber, paper & board production can cause **deforestation**. Large areas of forest are cut down and trees aren't planted to replace the old ones. This destroys the forest habitat for the wildlife.

Sourcing



The source of paper and boards is **trees**. Trees are cut down & taken to a paper mill. The wood is cut into small pieces which then go through a process called **pulping** which turns it into **pulp**. The pulp is then washed & rolled flat to form paper sheets.

Sustainability



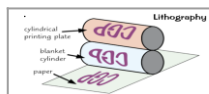
Paper & boards come from a **renewable resource**, timber that is used for paper & boards can be **regrown** or **replaced** to continue the supply of material. If this is done sustainability it should be an **infinite resource**.

Commercial Manufacturing

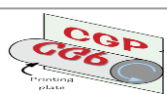


Commercial manufacturing processes used on paper and boards are lithography, offset-lithography with oily ink, flexography with printing plates, screen printing with screens, die-cutting, gravure and digital printing.

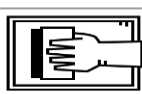
Manufacturing Processes



Lithography



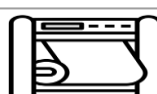
Flexography



Screen Printing



Die Cutting



Gravure



Digital Printing

Paper & Board Finishes



Paper & Board **finishes** may coat the surface forming a protective skin to prevent damage, make it last longer or improve its appearance.



Laminating



Embossing



Foil Application



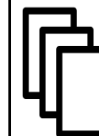
Varnishing



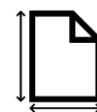
UV Varnishing

Stock Forms

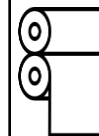
Paper & board can be bought in many forms:



Sheets: range in thickness, sizes & colours.



Sizes: paper & boards are sold in standard sizes starting from A0. Halving in size each time: A4, A5, A6



Rolls: comes in many sizes, lengths & thicknesses



Ply: paper & boards come in different ply's. Ply means how many layers there are e.g. 1-ply = 1 layer, 2-ply = 2 layers

Knowledge Organiser: KS4 Design Technology – Polymers Project

What is this project about?

In this project you will be learning about polymers. You will learn about the different types of polymers alongside sourcing, commercial manufacturing, commercial processes, sustainability & stock forms. You will spend your practical lessons developing your forming and shaping skills for polymer based products. You will be assessed on your practical work and use your theory work to embed your knowledge ready for your exam.

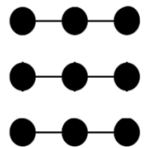
Polymers



Polymers originally come from crude oil. Plastics are made up of polymers but are often just referred to as 'polymers'. There are two types of polymers: they are known as thermoforming polymers (thermoplastics) and thermosetting polymers (thermoset plastics). Most polymers are **synthetic**, meaning they are man-made.



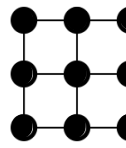
Thermoforming Polymers



Thermoforming polymers don't resist heat well. They are easily formed into different shapes such as by heating, melting and remoulding. They are easy to recycle by grinding them down or melting them.



Thermosetting Polymers



Thermosetting polymers are very heat resistant and therefore can resist heat & fire. They are permanently hard and rigid. They are non-recyclable because they cannot be melted or reshaped again.



Environmental Impact



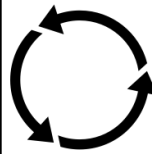
Polymers are **non-biodegradable** so they do not decompose naturally, if littered they negatively impact the environment by **polluting** waterways, damaging natural habitats or endangering animals & wildlife.

Sourcing



The source of polymers is **crude oil**. Crude oil is extracted from the ground (on land or at sea) it's then taken to a **refinery** to be heated in a process called **fractional distillation**. This separates the chemicals into fractions & creates polymers.

Sustainability



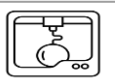
Polymers are a **non-renewable resource**, oil is a **finite resource** so it will run out. Polymers are **non-biodegradable** so do not decompose naturally. Polymers need to be recycled or reused to be more environmentally friendly.

Commercial Manufacturing

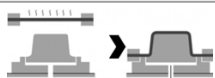


Commercial manufacturing processes used on polymers are: **Blow Moulding, Injection Moulding & Extrusion** – all moulding processes where polymers are heated then blown, injected or extruded into a mould.

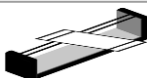
Manufacturing Processes



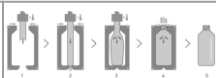
3D Printing



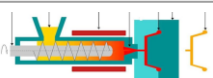
Vacuum Forming



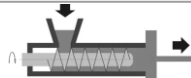
Strip Heating



Blow Moulding



Injection Moulding



Extrusion

Polymer Finishes



Polymers are **self-finishing** because they don't need protective surface finishes as they are already resistant to corrosion and decay like other materials aren't. However their appearance can be improved with the use of wet & dry paper to remove scratches, polish to add shine and vinyl decals for decoration.



Wet & Dry Paper



Polish



Vinyl Decals

Stock Forms

Polymers can be bought in many forms:



Sheets: comes in a variety of shapes & sizes. Can be cut to size, formed or bent.



Films: are used for vacuum forming and mainly for packaging.



Rods & Tubes: comes hollowed or solid. Can be cut to size or bent.



Granules: can be melted down and used for casting or moulding.



Foam: used for protective packaging & models.



Powders: can be used for coating materials & moulding.

Knowledge Organiser: KS4 Design Technology – Metals Project

What is this project about?

In this project you will be learning about metals and alloys. You will learn about the different types of metals and alloys alongside sourcing, commercial manufacturing, commercial processes, metal joining methods, sustainability & stock forms. You will spend your practical lessons developing your casting, forming and finishing skills for a pewter based product. You will be assessed on your practical work and use your theory work to embed your knowledge ready for your exam.

Metals



Metals originally come from metal ore and rocks. Some metals are pure metals and others are mixtures of metals; these are classed as alloys. There are two categories of metals and these are known as ferrous metals and non-ferrous metals. Some metals are very common whereas others are much rarer to find and therefore much more expensive.



Ferrous Metals



Ferrous Metals are metals or alloys that are mostly made up of iron. Due to the high quantity of iron within these metals they are magnetic. These metals often need protective coatings to prevent them from rusting.

Non-ferrous Metals



Non-ferrous Metals are metals or alloys that don't contain any iron and therefore won't rust & aren't magnetic. These metals are useful for outdoor use due to the fact even if they are exposed to moisture they do not rust.

Alloys



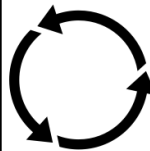
Alloys are formed when one or more elements are combined with a metal. This combination of elements brings enhanced properties such as increased strength, ductility, hardness, resistance to rust & heat.

Sourcing



The source of metals is **metal ore** which is **mined** from the ground. Metal ore is a rock which contains metal that can be **extracted**. Some metal ores can be crushed and then heated in a furnace to separate the material.

Sustainability



Metals are a **non-renewable resource**, metal ores are a **finite resource** so will run out. A lot of **non-renewable energy** is also used when metal is mined alongside also damaging eco-systems. Metals need to be recycled or reused.

Commercial Manufacturing



Commercial manufacturing processes used on metals are: **Milling** - removes material one layer at a time to produce a shape, **Casting** – for heating and pouring molten metal into a mould, **Turning** - turning metal by carving it into shape.

Metal Joining Methods



A **metal joint** is where pieces of metal are joined together. Metal joints are for practical purposes but they can also be used to improve strength, rigidity & toughness. Metal joining methods tend to involve heat and a joining material for the joint to be made.



Soldering



Brazing



Welding

Metal Finishes



Finishing metal refers to the process of refining or protecting a metal surface. Metals need to be smoothed and any grease removed from the surface. The **metal finish** may coat the surface forming a protective skin to prevent corrosion, make it last longer or improve its appearance.



Dip Coating



Powder Coating



Galvanising

Stock Forms

Metals can be bought in many forms, they are commonly available in a wide range of shapes and sizes, because it can be very difficult to convert one shape to another. Manufacturers buy the shape they need for the job. Metal stock forms include:



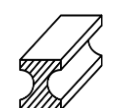
Sheets & Strips: comes in many shapes & sizes. Can be cut to size, formed or bent.



Bars: comes in many thicknesses & sizes



Rods & Tubes: comes hollowed or solid. Can be cut to size or bent.



Angles: used for frames, trims, brackets, corner guards & general construction

Knowledge Organiser: KS4 Design Technology – Polymers Project

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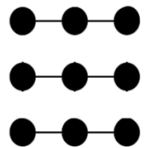
Polymers



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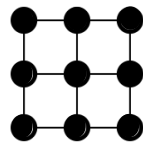
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Environmental Impact



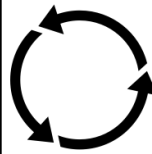
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Sustainability



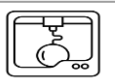
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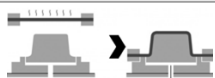


Commercial manufacturing processes used on polymers are: **Blow Moulding, Injection Moulding & Extrusion** – all moulding processes where polymers are heated then blown, injected or extruded into a mould.

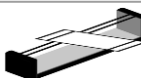
Manufacturing Processes



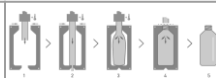
3D Printing



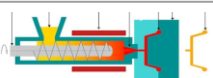
Vacuum Forming



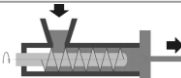
Strip Heating



Blow Moulding



Injection Moulding



Extrusion

Polymer Finishes



Polymers are **self-finishing** because they don't need protective surface finishes as they are already resistant to corrosion and decay like other materials aren't. However their appearance can be improved with the use of wet & dry paper to remove scratches, polish to add shine and vinyl decals for decoration.



Wet & Dry Paper



Polish



Vinyl Decals

Stock Forms

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