MATERIALS FACTSHEET

Thermoplastics

- Made up of long chains of molecules that are tangled together and have no fixed pattern
- When heated they become soft and can be bent, pressed or formed into different shapes. As the cool they become stiff again.
- This process can be repeated many times.
- Thermoplastics have a “memory” and when reheated will try to return to their original shape. This is known as “plastic memory”
- Examples are acrylic, polyethene, polyvinyl chloride (PVC), high-impact polystyrene (HIPS), acrylonitrile-butadiene-styrene (ABS)
Thermosetting plastics

- These are made up from long chains of molecules that are cross linked.
- This means they have a very rigid molecular structure.
- They will soften when heated but only the first time.
- They can be shaped the first time, but then are set due to their rigid molecular structure.
- They cannot be reheated and reshaped like thermoplastics.
- Two examples are polyester resin and urea formaldehyde.
# Acrylic

## Properties
- Good impact strength (tends not to shatter but to break into large pieces)
- Lightweight
- Good electrical insulator
- Durable

## Uses
- Ornamental fish tanks
- Baths and bathroom furniture
- Car indicator covers / reflectors

## Advantages
- Can be recycled
- Excellent environmental stability
- Polishes and finishes well
- Available in numerous colours

## Disadvantages
- Relatively soft
- Scratches easily
- Poor chemical resistance
Polyethene

Properties
- Tough
- Resistant to chemicals
- Soft and flexible
- Good electrical insulator

Uses
- Drawer bottoms
- Cabinet backs
- Smoothing out uneven floors
- Lightweight internal door cladding

Advantages
- Cheapest of all manufactured boards

Disadvantages
- Not very strong as it has no grain

Aesthetics
- Side very smooth and underside textured
### Polyvinyl chloride (PVC)

<table>
<thead>
<tr>
<th>Properties</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Good chemical resistance</td>
<td>• Pipes</td>
</tr>
<tr>
<td>• Weather resistant</td>
<td>• Rainwater pipes and guttering</td>
</tr>
<tr>
<td>• Lightweight</td>
<td>• Bottles</td>
</tr>
<tr>
<td>• Good electrical insulator</td>
<td>• Shoe soles</td>
</tr>
<tr>
<td>• Stiff</td>
<td>• Window frames and fascias</td>
</tr>
<tr>
<td>• Hard</td>
<td>• Water beds</td>
</tr>
<tr>
<td>• Tough</td>
<td>• Swimming pool toys</td>
</tr>
<tr>
<td>• Waterproof</td>
<td>• Electrical insulation tape</td>
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<tr>
<td>• Durable</td>
<td></td>
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<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Can be recycled</td>
<td>• Very expensive to recycle</td>
</tr>
<tr>
<td>• Relatively cheap to manufacture</td>
<td>• Dangerous fumes given off when burnt</td>
</tr>
</tbody>
</table>
# High impact polystyrene (HIPS)

## Properties
- Tough
- High impact strength
- Rigid
- Good electrical insulator

## Uses
- Food appliances
- Toys
- Cutlery
- DVD and CD cases

## Advantages
- Available in numerous colours
- Can be machined and painted
- Can be recycled

## Disadvantages
- Expensive
- Limited flexibility
- Will not biodegrade
# Acrylonitrile-butadiene-styrene (ABS)

## Properties
- High impact strength
- Tough
- Scratch resistant
- Lightweight
- Durable
- Good resistance to chemicals

## Uses
- Kitchenware
- Camera cases
- Toys
- Car components
- Telephone cases

## Advantages
- Available in numerous colours

## Disadvantages
- Relatively expensive when compared to polystyrene
# Polyester Resin

## Properties
- Good electrical insulator
- Hard
- Brittle
- Good heat and chemical resistance
- Resists UV radiation

## Uses
- Casting
- Encapsulation for biological specimens
- Boat hulls with fibreglass
- Model figures
- Adhesives
- Filler materials

## Advantages
- Can be mixed with pigments to achieve a range of colours
- Good resistance to water

## Disadvantages
- Contracts on curing
- Can cause excess heat when too much catalyst is used
# Urea Formaldehyde

## Properties
- Stiff
- Hard
- Brittle
- Scratch resistant
- Stain resistant
- High tensile strength

## Uses
- Tableware
- Worktop laminates
- Buttons
- Electrical casings

## Advantages
- Can be coloured
- High surface hardness

## Disadvantages
- Toxic fumes given off when it cures.