Be able to describe enhancement methods for given materials and explain their suitability for specific product applications.

## 1. Polymer Enhancement

Use of additives to enhance properties, including;

| | | |
|---|---|---|
| 1 | **UV Stabilisers** | Used to prevent "photo degradation" which occurs when **ultraviolet** (UV Light) radiation coming from an artificial light source or the **Sun** destroys the chemical bonds within a polymer. This prolongs the life of the polymer – e.g. **Patio furniture or uPVC. cladding** |
| 2 | **Bio-Batch Materials** | Added to raw polymers to to encourage biodegradability in the final product – e.g. **Food packaging or carrier bags**. The addition of only **one percent** of bio-batch, will transform polymers, into biodegradable polymers. PE PP PVC PET PS LDPE HDPE. |

## 2. Wood Enhancement

Enhancing Timber Products With Preservatives, Finishes And Coatings

| | | |
|---|---|---|
| 4 | **Preservatives** | Introduction of stable chemicals into **timber** that protect the it from organisms like fungi and insects & rot. – Tanalise or other pressure treated wood. |
| 5 | **Coatings;**<br>Lacquer<br>Oil-Based<br>Polyurethane Varnish<br>Wax<br>Water-Based<br>Shellac | <br>Dries faster than other finishes; usually sprayed on.<br>Dries slowly. Easy to apply with a brush or cloth.<br>Highly durable, water-resistant. Very durable. Ideal for use on doors and marine finishes.<br>Offers a glossy sheen. Not as durable as other finishes.<br>Dries quickly. Can be used on bare, stained or painted wood<br>Provides a hard finish that dries quickly. May break down over time. |

## 2. Wood Enhancement

Combining Of Natural Timber With Resins And Lamination To Give Enhanced Properties - Increased **Strength And Stability**

| | | |
|---|---|---|
| 1 | **Plywood**  | Strong thin wooden board consisting of two or more layers glued and pressed together with the **direction of the grain alternating**. – Used in furniture & flooring. |
| 2 | **Laminated Veneer Lumber (LVL)**  | An engineered wood product that uses multiple layers of thin wood, oriented in the **same direction**, assembled with resins – weather-resistant **melamine resins**, while for interior applications **urea resin** – used in beams & other structures. |
| 3 | **Glulam**  | Laminating a number of smaller pieces of wood into a single large, strong, structural member. Manufactured engineered **wood** is made from layers of parallel timber laminations. |

## 3. Metal Enhancement

Heat Treatment Methods Of Enhancing Metals;

| | | |
|---|---|---|
| 1 | **Case Hardening**  | The mild steel is subjected to heating till it is bright red. It is **immersed into a carbon compound** that covers the outer surface |
| 2 | **Hardening** | Hardening is the process of **increasing the hardness of the material by heating and then quickly cooling**. |
| 3 | **Tempering** | Tempering is the heating process to a temperature below is critical range, holding and then cooling slowly. |
| 4 | **Annealing** | Heat metal and allow it to **cool very slowly**, in order to remove internal stresses and toughen it. |
| 6 | **Normalising** | Normalising is a heat treatment process that is used to make a metal **more ductile and tough** after it has been subjected to thermal or mechanical hardening processes. |
| 7 | **Nitriding** | Nitriding is a heat treating process that **diffuses nitrogen into the surface of a metal** to create a case-hardened surface. |
| 8 | **Quenching** | The **rapid cooling** of a workpiece in water, oil or air. Used to **harden steels**. |