

Paint

Paint is an organic coating. It is defined as a mechanical dispersion mixture of one or more pigments in a vehicle. The vehicle is a liquid consisting of drying oil, a higher volatile solvent thinner and film-forming material. When paints are applied on the surface of materials, the paint film dries up by the process of evaporation followed by oxidation and polymerization of drying oils.

Constituents of Paints

Basically, paints constitute pigments, volatile solvent, film forming material and drying oil. However, in order to produce the desired effect into the paints, specific types of additives are used:

- a. **PIGMENTS:** Solid substances which provide desired colour to the paints. Some of the commonly used pigments are white pigment (zinc oxide, titanium oxide, etc.), red pigment (red lead, ferric oxide, etc.), blue pigment, black pigment (carbon black), etc.
- b. **THINNER:** A volatile solvent used to reduce the viscosity of paints.
- c. **DRYING OIL:** It is unsaturated fatty oil which helps to dry up the paints by its oxidation and polymerization. This is also known as hardening oil. E.g. linseed oil, etc.
- d. **EXTENDER OR FILLER:** It is used for filling the gaps in the film to get uniform film of the paints. It also helps to increase the durability of the paints film. The commonly employed extenders are BaSO_4 , CaSO_4 , CaCO_3 , etc.
- e. **DRIERS:** It is used to accelerate the drying of paint film of the paints through oxidation, polymerization and condensation. The most effective driers are resonates, tungstates of Co, Zn, etc.
- f. **PLASTICIZERS:** It increases the elasticity of the paint film, e.g. vegetable oils, triphenyl phosphate, etc.
- g. **STABILIZERS:** It provides chemical inertness to the emulsion of paints. E.g. proteins like dextrin, casein, starch, etc.
- h. **PRESERVATIVES:** It prevents the decomposition of proteins and eliminates the growth of fungus, e.g. mercuric chloride.
- i. **ANTIFOAMING AGENTS:** It prevents the formation of foams, especially during the manufacture and application of paints, e.g. pine oil, kerosene, etc.

Paints are specially used for the protection, decoration and special purposes (e.g. temperature indication, fire retardant, etc.). The high quality paints should possess the following characteristics:

- ✓ High adhesion capacity to the material over which it is intended to be used
- ✓ Easily applicable with brush or spraying device

- ✓ Spread easily over the protected surface
- ✓ High covering power
- ✓ Form a quite tough, uniform, adherent and imperious film
- ✓ Not get cracked on drying
- ✓ Protect the painted surface from corrosion
- ✓ The colour should be glossy and quite stable to the effect of atmosphere and other agencies.

Types of Paints

On the basis of chemical composition and their possessions on the surfaces of the base material, paints are broadly classified into five groups:

1. VARNISH

It is a homogeneous colloidal dispersion solution of natural or synthetic resin. It is used as a protective and/or decorative coating of suitable surfaces. Varnish should

- (i) Be soft and tender to adapt itself to the contraction/expansion of coated material like wood due to temperature variation,
- (ii) Dry quickly,
- (iii) Produce a protective film,
- (iv) Produce glossy or shining film on drying,
- (v) Yield elastic film, which does not crack or peel off on drying,
- (vi) Yield film, whose colour does not fade or change on exposure to atmospheric weather, and
- (vii) Not shrink or crack after drying

There are two main types of varnishes:

- a. **Oil Varnish:** It is prepared by dissolving resins in drying oil and volatile solvent. This type of varnish dries up by the process of evaporation of volatile solvent followed by oxidation and polymerization of the drying oil. Drying oil reduces the brittleness of the resin and increases the elasticity of the varnish film.
- b. **Spirit Varnish:** It is prepared by dissolving resin in a volatile solvent. This type of varnish dries up rapidly by the process of evaporation. The film so formed is comparatively brittle and peel off more easily.

Uses of Varnishes

- a. For the protection of articles against corrosion
- b. As a brightening coat to painted surface
- c. For improving the appearance and intensifying the ornamental grains of wood surfaces.

2. ENAMELS

It is a pigmented varnish. It is a dispersion mixture of pigments in varnish. They give lustrous, hard and glossy finish on drying. There are two types of enamel:

- a. **Air drying enamel:** It dries up by oxidation and polymerization at room temperature.
- b. **Baking enamel:** It dries up at elevated temperatures either in presence or absence of oxygen.

3. LACQUERS

It is a colloidal dispersion of a cellulose derivative (cellulose nitrate or cellulose ester), resin and plasticizer in solvent and diluents. It dries up by evaporation of solvents, yielding a transparent, hard and water-proof film.

Uses of Lacquers

- a. For interior decorations like painting of woodwork and furniture
- b. For giving a finishing coat to automobile bodies, due to their resistance to abrasion, cracking, chalking, etc.
- c. In coating cotton fabrics, which are used in preparing artificial leathers, etc.

4. EMULSION PAINTS

It is a dispersion mixture of rubber like resin in water. Emulsion paints can be thinned or diluted in water. When emulsion paint is applied on to the surface, water evaporates and resinous particles unite to form homogeneous and clear film.

Uses of Emulsion Paints

They are useful in coating porous and/or wet surface, because they have less penetrating power than solvent-containing coating. They wet readily moist surfaces. Emulsion paints are less odorous, non-inflammable, quick drying and easier to apply than ordinary paints or lacquers. It can be recoated several times.

5. SPECIAL PAINTS

They are obtained by mixing paints with specific types of additives for special effects. There are several types of special paints:

- a. **Luminescent Paints:** They fluoresce under the influence of UV light. Luminophore pigments include ZnS, Titania with a small amount of colour modifier like Cu, Ag, Mn and B, called activators.
- b. **Heat resistant Paints:** They withstand temperatures, even up to red heat. They contain base of metallic powders like Al, Zn, Sn, graphite, titania, chromia, etc. Such paints are used as finishes of oven, furnaces, aircraft combustion chambers, etc.
- c. **Cement Paints:** The ingredients are white cement, lime water $[\text{Ca}(\text{OH})_2]$, pigment, very fine scent, water repellent compounds. They are widely used in interior and exterior coatings of the brick walls.
- d. **Aluminium Paints:** The fine powder of aluminium is mixed either with a spirit varnish or an oil varnish. It is widely used to paint the metal surfaces as it is less corrosive and bright in appearance.
- e. **Distempers (Water Paints):** The ingredients of distempers are whitening or chalk powder, glue, coloring pigment and water. They are used as finishing coat on white-washed surfaces of interior walls, plastered surfaces of interior walls, external surfaces of brick works, concrete.
- f. **Fire retardant Paints:** They contain PVC, chlorinated rubber, etc. They break down at elevated temperatures producing non-inflammable gases (like CO_2 , NH_3 , water vapour, HCl , HBr) which retard fire by diluting inflammable gases.
- g. **Cellulose Paints:** They are prepared by dissolving nitro-cellulose in thinner.
- h. **Coal tar Paints:** They are prepared by dissolving coal tar in spirit or other volatile solvent. They are good for protecting iron underground.
- i. Antifouling paints are used in marine constructions. They specially contain antifouling agents like HgO , Cu_2O , penta chlor mercury naphthenate, etc. which retard the fouling of ships, pier, etc. by marine worms, fungi, etc.
- j. Temperature indicating paints
- k. Water repellent paints

Application of Paints

- To coat the metallic surfaces in order to prevent them from corrosion (paints)
- To make the furniture attractive in appearance (synthetic paints)
- To protect as well as decorate the buildings (cement paints)
- Finishing the oven, furnaces, aircraft combustion chambers, etc. (heat resistant paints)
- To give brightness and make uniform protective coating over the surfaces (varnishes)
- To reduce the foul smelling in ships due to marine worms and fungus attack
- To indicate the temperature change in the environment by changing colours