Building Materials II

Lecture 10

Paint Composition

Paint is a colored substance which is spread over a surface and dries to leave a thin decorative and protective coating.

What is the function of paints?

Paints basically protect, preserve and pretty or beautify. So protection. Protection of the path surface from the environmental factors oxygen and other chemically active gases, moisture, dissolved Salts and other chemicals, temperature, bacteria and fungi, insects also the protection of, protection from corrosion and weathering which is the most important aspect of protection. In a way changing the surface properties like making a surface anti friction, increasing the hardness of the surface or lessening the electrical conductivity of a surface by painting on it. That also in a way gives protection to the surface. Now aesthetic appearance: Preserving, any surface that is painted on, is also preserved. For example a timber surface that is painted on, is better preserved than a timber surface that is unpainted on. Soap reservation comes in hand with protection and preservation also increases the life or the surface of timber that is painted on. Now when it comes to pretty or beautify for increasing the aesthetic value of the painted surface. Aesthetic appearance provided by the paint color and sheet for example satin finish or glossy finish that looks better than the natural surface or how it was left raw. And providing a desired ability of reflection or absorption of heat and light. Also about rendering a color to the painted surface an identification or psychological relation of product according to the color of paint it happens. For example if you see, when you see a wall with paint red and white stripes it is automatically related to the temples , temple walls are striped like that . So identification happens, this color belongs to that kind of psychological identification happens.

What is a paint composed of?

Paint is composed of majorly three components,

1. Pigments,Pigments and second is additives and third is vehicle or carrier. This vehicle Carriers consists of solvents and Binder or resins. Let us start with vehicles. Vehicles can consist of only the Binder and plus solvent. Binder is also called as resin and solvent is also called as diluent. Now when the vehicle is composed of the Binder, or if it is necessary to bind the Binder with light solvent or water it is a combination of binder + diluent. In this case once the paint has dried or cured. It is very nearly of all the diluent has evaporated and only the Binder is left on the coated surface. . So now we will look into detail as what is a Binder and what is a solvent. Starting with Binder. They are also called as a resin. Basically the Binder as the name suggests it binds or glues the ingredients, pigments and additives and everything of paints together. The Binder is the film forming component of the paint. It is the only component always present about all the various types of formulations. Many binders are to take to be applied and must be thinned. The type of thinner if present varies with the Binder. For certain type of Binder, you need certain type of water based thinners and for certain type of binders you need oil

based thinners. So This Binder imports properties such as gloss, durability, flexibility and toughness to the paint. Also it provides adhesion to the substrate as in the surface to be painted on. Binder also provides durability and resistance properties. Such as UV resistance, moisture resistant, chemical resistance, stain resistance, fade resistance, chalk resistance, and block resistance. So when a paint dries of the thin layer that is formed is a protective coating that is basically the Binder. Now let us see what a solvent is. Solvents are also called as diluent or thinner. They majorly adjust the viscosity of paint. Solvents control the flow and application properties. They can also affect the stability of the paint while in liquid state. Solvent is also volatile and it does not become part of the paint film. It is a carrier for the nonvolatile component like binder, pigments filler etc. These volatile solvent imports the property temporarily. Once the solvent has evaporated the remaining paint is fixed to the surface. The component or the solvent is an optional component. Some Paints don't have any solvent. So what happens is when the Binder and the solvents are together in a paint, a Binder is the one which binds all the component, and the solvent is the one which thins makes it easier to apply on Paints. So when the paint dry off only the binder film is left. All the solvent is evaporated off. Now the major materials that are used as solvent are: Water which is a main vehicle in water based Paints. Solvent based Paints have combination of solvents as the vehicle including aliphatic, alcohols etc. there are also organic solvents available like petroleum distillate, esters, glycol esters and the like. Next component is pigment. Pigment is the main component that renders color to the paint. Many experiments and Research are being performed as we speak, to find a better intense, safe, ecofriendly pigments, we will now see the most widely used pigments to to render different types of colors of paints. Pigments we have, natural pigments also and synthetic pigments also can be used. For black color, lampblack, vegetable black and graphite is used. For brown, raw umber, burnt umber are used. For blue Prussian blue, ultra marine blue pigments are used. For red, Indian red, red LED, iron oxide are used. Iron oxide is the widely used pigment for red. And Shades Of Red. And for yellow, you have chrome yellow and yellow ochre. And for green you have, green Earth and Chrome green. But the most important pigment of all is white. Titanium dioxide is the most widely used pigment for white color because world's most primary pigment for providing whiteness brightness and opacity. Also it provides excellent hiding power and whiteness it is also available as a solid powder or also as liquid in slurry form. Next component is additives. Additives import improve certain property of the paint. They are usually mixed in very small amount and it give a very significant effect of the product. Additives are used to do the following improvements like: Modify surface tensionImprove flow propertiesimprove finished appearance like making it glossy or Matte or having a particular texture.Improve pigment stabilityControl foaming Control skinningTexturizersAdhesion promoters.UV stabilizers.Even additives are used to make paint antibacterial or hydro phobic.

The next component is fillers.

Fingers are a special type of pigment that serves to thicken the film, support the structure of the paint and increase the volume. The major function of the filler as the name suggests is to paint or increase the volume of the paint. Fillers are usually comprised of cheap inert materials such as talc, lime, clay etc. Now fillers do not have very intense effect on the pigment or the color but

they have a very moderate effect in the color of the final product. As in it decreases the saturation level of the pigment. Automatically it lighten the pigment a little bit.

Paint Manufacture

Now let's see how the paint is manufactured. The following are the various steps

In Paint manufacturing. First raw material or making the paste. Then dispersing the pigment. Then thinning and canning. And in between these two we also have lab testing. So raw materials. Pigment manufacturers send bags of find green pigments to paint plants. There the pigment is premixed with resin or binder a wetting agent that assist in moistening the pigment. One or more solvents and additives to form a paste. Now how the paste is made. This involves mixing the pigment with resin solvents and additives to form a paste. Now, this additives, all additives accept the dryers. Dryers are also part of additives that impart that improve the drying quality of the paint. Usually dryers are added at a later stage. So in this stage only pigments, resins, solvent and additives are added. Next stage is

Dispersing the pigment:

The best mixture for most industrial is rooted into a sand mill, a large cylinder that agitates tiny particles of sand or silica to grind the pigment particles. Making them smaller and disbursing them throughout the mixture. The mixture is then filtered to remove the sand particles. So you see this, this one is the sand mill in which pigment and all the paste is mixed throughout to have a homogenous disbursement of pigment. The Sand mill is used for industrial paint demand instead of being processed in sand mill up to 90% of water based latex paint designs is used for individual home owners. Commercial use our instant process in a high speed dispersion tank. There the premixed paste is subjected to high speed agitation by a circular tooth blade attached to a rotating shaft. This process blends the pigment into solvent. So you see this, this is a high speed dispersion tanks, there the premixed paste is subjected to high speed agitation by a circular tooth blade attached to a rotating shaft. This process blends the pigment into solvent. Next stage is thinning of the paste. The thinner, the solvent or the diluent is added to the paste and also the additional additives that is the dryers is added to the paste. Weather created by A Sand mill or a dispersion tank, the best must now be thin to produce the final product. The whole paste is after the paint is done Transferred to Large cattle's it is agitated with proper amount of solvent for the type of paint desired. After the paint is thin, we get the embedded of the paint. A sample of the paint is taken to the lab for testing. The sample is tested for desired properties and characteristics required of the finish to paint. If the sample is not up to requirement it is taken back to plant to add thinner or additive or any other compound according to the requirement. Finally when the desired type of paint is, when you have received the desired amount of paint the paint is sent for Canning. A paint Canning is completely automated process. The finished paint product is pumped into the Canning room. Father Standard 8 print, 3.87 filter paint can available to consumers, empty cans are first rolled horizontally onto labels set up right so that the paint can be pump into them. So it is completely automated. A machine full up the cans .a machine puts the lids on the. And a machine even seals up the cans and the cans are then taken for stalking and send to the go down. This process is completely automated. Now this is the paint manufacturer

layout. We will just quickly summaries what we have learnt. So fast we have pigment and fillers, binders and your additives. Additives except dryers. These three things are first added and made a paste then they are send to sand mill or dispersion tank and properly mixed. Finally they arrived at the thinning tank where the dryers and solvents are mixed. This mixture is then completely and thoroughly mixed you can do screens where, from which you get a better fine paint which is taken to the labelling machine or canning unit. Where it is scanned and sent. In this, thinning tank a portion or sample of the paint is taken for testing also and if it is not up to the standard it is again put in the tank and the solvents and dryers or additive are added to make them proper. What is a good paint? So what is a good paint? A good paint should be cheap, it should be easy and it should be available to the user that is it should not be toxic. It should retain its original color for a long time, for a long time it should not fade away. It should be able to cover maximum area of the surface with minimum quantities. It should provide easy workability. The painted Surface should dry not too slowly not too rapidly. The thickness of the paint film should be adequate for good protection and decoration of the surface. The paint should form a hard and durable core on the painted surface. Paintshould not feel off from the painted surface. It should stick well to the surface and Seal the poressubstrata. Substrate meaning the surface on which the paint is coated on. It should be a good fire and moisture resistant. It should offer resistance to failure by checking, cracking and faking. The painted surface should possess very attractive and decorative pleasing appearance. The paint film should with stand adverse weather effects for a long time without closing its gloss painted surface. Now these characteristics of a good paint will help us to determine or choose a good paint or this is the criteria for the selection of a good paint.

Types of Paint

Now let us see the different types of paints.

Paint have a wide variety of types for a different types of applications. We can classify the paints based on the binder being used, the diluent being used,and the material on which the paint is going to be applied. And function of the main component of the paint. And the location where the paint is applied. So for binder we have oil based binder, epoxy binder, alkyd binder and acrylic binder.So only few examples of Binder. Oil paint usually utilizes a drying oil that oxidizes and hardens to form a tough elastic film when exposed to thin layer of air. While alkyd paints as a Binder and alkyd resin such as chemically modified salt and linseed oil, latex paint are acrylic paints they have an acrylic Binder. We have acrylic resin that quality's as water evaporates. So when the water from the acrylic paint evaporates the acrylic film is left as thin film emulsion that is made of acrylic, acrylic resin is left on the paint surface. while epoxy Paints having, epoxy resin binder for increased, epoxy resin gives increased resistance to corrosion and emulsion and Chemical bases on diluent we have water based diluent organic solid waste diluent. We saw examples of organic solvent in previous slides which was Ester alcohol and all. Water paste, obviously water based dilute tents have water as the base, water as the thinner and they are mostly available in water or liquid form. Are the products is available in liquid form. Also certain water based, a very good example of water based paint is distemper. It is usually

available in powdered form which is with water required, required amount of water before it is applied. Now based on materials you have, wall paint, metal paint and paint for wood. Distemper primer, Enamel, emulsion. You must have heard these words very commonly. Distemper as I said before it is an available in powdered form. Primer and enamel are all available in liquid forms. For metals we have enamel paint also we have, we also have primer especially for metals we have to apply the primer on the metals before we have apply the enamel. For wood we have varnishes. You could have known varnishes are translucent type of protective coating. And they render a very little slight change of color to the natural wood. natural wood and then also you have wood paint which is or opaque while varnish are translucent , almost transparent to translucent wood paint are completely opaque , completely covered with natural grain of the wood. Then based on the function of the component, major component of the protective coating we have primer, sealant, under coat and finishing Coat. Primer as name suggest is the primary or preparatory first Coat. Sealant is the final coat which completely seals of anything, seals of everything, all fights of physical barrier between the painted surface and the atmospheric factors. Under coats are the quotes between the primer and the final Coat. And the final Coat or the finishing coat is the final coat you see on any painted surfaces. Now based on the location you have the interior, interior Paints and exterior paints. There are special type of paints for example fire resistant, heat resistant, anticorrosive, antibacterial paint which is widely used in hospitals hydrophobic paint, bituminous paint, and cement paint. Cement Paint is currently trending kind of paint which is widely used nowadays. It has huge base off. The major component of base paint is white cement.