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Manufacturing of Cow Dung Paint

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Abstract
The main objective of the manufacturing of the cow dung paint is to supply the non volatile paints which are helpful in killing microbes and bacteria and health friendly. This can further be developed by making it washable and with better shelf life cow dung acts an insulator. It helps keep warm in winter and cool in summer. Due to this antibacterial property it helps kill micro organisms. Moreover cow dung has been used since ages and are available in plenty of amount. Hence cost of production is relatively very low. It is heat resistant and considered antiseptic in nature.

Keywords
Volatile Paints, Shelf Life, Anti Bacterial Actionsi.

Introduction

What are paints?

Paint is any liquid, liquefiable, or mastic composition that, after application to a substrate in a thin layer, converts to a solid film. It is most commonly used to protect, colour, or provide texture to objects. Paint can be made or purchased in many colours—and in many different types, such as watercolour, synthetic, etc. Paint is typically stored, sold, and applied as a liquid, but most types dry into a solid.

Components of A Paint

Vehicle

The vehicle is composed of the binder; or, if it is necessary to thin the binder with a diluent like solvent or water, it is the combination of binder + diluents. In this case, once the paint has dried or cured very nearly all of the diluents has evaporated and only the binder is left on the coated surface. Thus, an important quantity in coatings formulation is the "vehicle solids", sometimes called the "resin solids" of the formula. This is the proportion of the wet coating weight that is binder, i.e. the polymer backbone of the film that will remain after drying or curing is complete.

Binder or film former

The binder is the film-forming component of paint. It is the only component that is always present among all the various types of formulations. Many binders are too thick to be applied and must be thinned. The type of thinner, if present, varies with the binder.

The binder imparts properties such as gloss, durability, flexibility, and toughness.

Binders include synthetic or natural resins such as alkyds, acrylics, vinyl-acrylics, vinyl acetate/ethylene (VAE), polyurethanes, polyesters, melamine resins, epoxy, silanes or siloxanes or oils.

Binders can be categorized according to the mechanisms for film formation. Thermoplastic mechanisms include drying and coalescence. Drying refers to simple evaporation of the solvent or thinner to leave a coherent film behind. Coalescence refers to a mechanism that involves drying followed by actual interpenetration and fusion of formerly discrete particles. Thermoplastic film-forming mechanisms are sometimes described as "thermoplastic cure" but that is a misnomer because no chemical curing reactions are required to knit the film. Thermosetting mechanisms, on the other hand, are true curing mechanism that involves chemical reaction(s) among the polymers that make up the binder.

Thermoplastic mechanisms: Some films are formed by simple cooling of the binder. For example, encaustic or wax paints are liquid when warm, and harden upon cooling. In many cases, they resoften or liquify if reheated.

Paints that dry by solvent evaporation and contain the solid binder dissolved in a solvent are known as lacquers. A solid film forms when the solvent evaporates. Because no chemical cross linking is involved, the film can re-dissolve in solvent; as such, lacquers are unsuitable for applications where chemical resistance is important. Classic nitrocellulose lacquers fall into this category, as do non-grain raising stains composed of dyes dissolved in solvent. Performance varies by formulation, but lacquers generally tend to have better UV resistance and lower corrosion resistance than comparable systems that cure by polymerization or coalescence.

The paint type known as Emulsion in the UK and Latex in the USA is a water-borne dispersion of sub-micrometer polymer particles. These terms in their respective countries cover all paints that use synthetic polymers such as acrylic, vinyl acrylic (PVA), styrene acrylic, etc. as binders. The term "latex" in the context of paint in the USA simply means an aqueous dispersion; latex rubber from the rubber tree is not an ingredient. These dispersions are prepared by emulsion polymerization. Such paints cure by a process called coalescence where first the water, and then the trace, or coalescing, solvent, evaporate and draw together and soften the binder particles and fuse them together into irreversibly bound networked structures, so that the paint cannot re dissolve in the solvent/water that originally carried it. The residual surfactants in paint, as well as hydrolytic effects with some polymers cause the paint to remain susceptible to softening and, over time, degradation by water. The general term of latex paint is usually used in the USA, while the term emulsion paint is used for the same products in the UK and the term latex paint is not used at all.

Thermosetting mechanisms: Paints that cure by polymerization are generally one- or two-package coatings that polymerize by way of a chemical reaction, and cure into a cross linked film. Depending on composition they may need to dry first, by evaporation of solvent. Classic two-package epoxies or polyurethanes would fall into this category.

The “drying oils”, counter-intuitively, actually cure by a cross linking reaction even if they are not put through an oven cycle and seem to simply dry in air. The film formation mechanism of the simplest examples involve first evaporation of solvents followed by reaction with oxygen from the environment over a period of days, weeks and even months to create a cross linked network. Classic alkyd enamels would fall into this category. Oxidative cure coatings are catalyzed by metal complex driers such as cobalt naphthenate.

Recent environmental requirements restrict the use of volatile organic compounds (VOCs), and alternative means of curing have been developed, generally for industrial purposes. UV curing paints, for example, enable formulation with very low amounts of solvent, or even none at all. This can be achieved because of the monomers and oligomers used in the coating have relatively very low molecular weight, and are therefore low enough in viscosity to enable good fluid flow without the need for additional thinner. If solvent is present in significant amounts, generally it is mostly evaporated first and then cross linking is initiated by ultraviolet light. Similarly, powder coatings contain little or no solvent. Flow and cure are produced by heating of the substrate after electrostatic application of the dry powder.

Combination mechanisms: So-called “catalyzed” lacquers” or “cross linking latex” coatings are designed to form films by a combination of methods: classic drying plus a curing reaction that benefits from the catalyst. There are paints called plastisols/ organosols, which are made by blending PVC granules with a plasticiser. These are stoved and the mix coalesces.

Diluent or solvent or thinner

The main purposes of the diluent are to dissolve the polymer and adjust the viscosity of the paint. It is volatile and does not become part of the paint film. It also controls flow and application properties, and in some cases can affect the stability of the paint while in liquid state. Its main function is as the carrier for the non volatile components. To spread heavier oils (for example, linseed) as in oil-based interior house paint, a thinner oil is required. These volatile substances impart their properties temporarily—once the solvent has evaporated, the remaining paint is fixed to the surface.

This component is optional: some paints have no diluent.

Water is the main diluent for water-borne paints, even the co-solvent types.

Solvent-borne, also called oil-based, paints can have various combinations of organic solvents as the diluent, including aliphatics, aromatics, alcohols, ketones and white spirit. Specific examples are organic solvents such as petroleum distillate, esters, glycol ethers, and the like. Sometimes volatile low-molecular weight synthetic resins also serve as diluents.

Pigment and filler

Pigments are granular solids incorporated in the paint to contribute color. Fillers are granular solids incorporate to impart toughness, texture, give the paint special properties, or to reduce the cost of the paint. Alternatively, some paints contain dyes instead of or in combination with pigments.

Pigments can be classified as either natural or synthetic. Natural pigments include various clays, calcium carbonate, mica, silica, and talc. Synthetics would include engineered molecules, calcined clays, blanc fixe, precipitated calcium carbonate, and synthetic pyrogenic silica.

Hiding pigments, in making paint opaque, also protect the substrate from the harmful effects of ultraviolet light. Hiding pigments include titanium dioxide, phthalo blue, red iron oxide, and many others.

Fillers are a special type of pigment that serve to thicken the film, support its structure and increase the volume of the paint. Fillers are usually cheap and inert materials, such as diatomaceous earth, talc, lime, barytes, clay, etc. Floor paints that must resist abrasion may contain fine quartz sand as a filler. Not all paints include fillers. On the other hand, some paints contain large proportions of pigment/filler and binder.

Some pigments are toxic, such as the lead pigments that are used in lead paint. Paint manufacturers began replacing white lead pigments with titanium white (titanium dioxide), before lead was banned in paint for residential use in 1978 by the US Consumer Product Safety Commission. The titanium dioxide used in most paints today is often coated with silica/alumina/zirconium for various reasons, such as better exterior durability, or better hiding performance (opacity) promoted by more optimal spacing within the paint film.

Additives

Besides the three main categories of ingredients, paint can have a wide variety of miscellaneous additives, which are usually added in small amounts, yet provide a significant effect on the product. Some examples include additives to modify surface tension, improve flow properties, improve the finished appearance, increase wet edge, improve pigment stability, impart antifreeze properties, control foaming, control skinning, etc. Other types of additives include catalysts, thickeners, stabilizers, emulsifiers, texturizers, adhesion promoters, UV stabilizers, flatteners (de-glossing agents), biocides to fight bacterial growth, and the like.

Additives normally do not significantly alter the percentages of individual components in a formulation.

Color changing paint

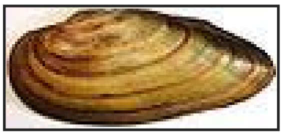
Various technologies exist for making paints that change color. Thermochromic paints and coatings contain materials that change conformation when heat is applied or removed, and so they change color. Liquid crystals have been used in such paints, such as in the thermometer strips and tapes used in aquaria and novelty/ promotional thermal cups and straws. These materials are used to make eyeglasses.

Color-changing paints can also be made by adding halochrome compounds or other organic pigments. One patent[1] cites use of these indicators for wall coating applications for light colored paints. When the paint is wet it is pink in color but upon drying it regains its original white color. As cited in patent, this property of the paint enabled two or more coats to be applied on a wall properly and evenly. The previous coats having dried would be white whereas the new wet coat would be distinctly pink. Ashland Inc. introduced foundry refractory coatings with similar principle in 2005 for use in foundries.

Art

Watercolors as applied with a brush

Since the time of the Renaissance, siccative (drying) oil paints, primarily linseed oil, have been the most commonly used kind of paints in fine art applications; oil paint is still common today. However, in the 20th century, water-based paints, including watercolors and acrylic paints, became very popular with the development of acrylic and other latex paints. Milk paints (also called casein), where the medium is derived from the natural emulsion that is milk, were popular in the 19th century and are still available today. Egg tempera (where the medium is an emulsion of raw egg yolk mixed with oil) is still in use as well, as are encaustic wax-based paints. Gouache is a variety of opaque watercolor that was also used in the middle Ages and Renaissance for manuscript illuminations. The pigment was often made from ground semiprecious stones such as lapis lazuli and the binder made from either gum arabic or egg white. Gouache, also known as 'designer color' or 'body color' is commercially available today.
Poster paint has been used primarily in the creation of student works, or by children.



The "painter's mussel", a European freshwater mussel. Individual shell valves were used by artists as a small dish for paint.

Application

Paint can be applied as a solid, a gaseous suspension (aerosol) or a liquid. Techniques vary depending on the practical or artistic results desired.
As a **solid** (usually used in industrial and automotive applications), the paint is applied as a very fine powder, then baked at high temperature. This melts the powder and causes it to adhere to the surface. The reasons for doing this involve the chemistries of the paint, the surface itself, and perhaps even the chemistry of the substrate (the object being painted). This is called "powder coating" an object.
As a **gas** or as a gaseous suspension, the paint is suspended in solid or liquid form in a gas that is sprayed on an object. The paint sticks to the object. This is called "spray painting" an object. The reasons for doing this include:

- The application mechanism is air and thus no solid object touches the object being painted;
- The distribution of the paint is uniform, so there are no sharp lines;
- It is possible to deliver very small amounts of paint;
- A chemical (typically a solvent) can be sprayed along with the paint to dissolve together both the delivered paint and the chemicals on the surface of the object being painted;
- Some chemical reactions in paint involve the orientation of the paint molecules.

In the **liquid** application, paint can be applied by direct application using brushes, paint rollers, blades, scrapers, other instruments, or body parts such as fingers and thumbs.
Rollers generally have a handle that allows for different lengths of poles to be attached, allowing painting at different heights. Generally, roller application requires two coats for even color. A roller with a thicker nap is used to apply paint on uneven surfaces. Edges are often finished with an angled brush.

- Using the finish flat one would most likely use a 1/2" nap roller
- Using the finish eggshell one would most likely use a 3/8" nap roller
- Using the finish satin or pearl one would most likely use a 3/8" nap roller
- Using the finish semi-gloss or gloss one would most likely use a 3/16" nap roller

After liquid paint is applied, there is an interval during which it can be blended with additional painted regions (at the "wet edge") called "open time". The open time of an oil or alkyd-based emulsion paint can be extended by adding white spirit, similar glycols such as Dowanol (propylene glycol ether) or open time prolongers. This can also facilitate the mixing of different wet paint layers for aesthetic effect. Latex and acrylic emulsions require the use of drying retardants suitable for water-based coatings.
Paint application by spray is the most popular method in industry. In this, paint is atomized by the force of compressed air or by the action of high pressure compression of the paint itself, and the paint is turned into small droplets that travel to the article to be painted. Alternate methods are airless spray, hot spray, hot airless spray, and any of these with an electrostatic spray included. There are numerous electrostatic methods available.
Dipping used to be the norm for objects such as filing cabinets, but this has been replaced by high speed air turbine driven bells with electrostatic spray. Car bodies are primed using cathodic elephoretic primer, which is applied by charging the body depositing a layer of primer. The unchanged residue is rinsed off and the primer stoved.
Many paints tend to separate when stored, the heavier components settling to the bottom, and require mixing before use. Some paint outlets have machines for mixing the paint by shaking the can vigorously for a few minutes.
The opacity and the film thickness of paint may be measured using a drawdown card.
Water-based paints tend to be the easiest to clean up after use; the brushes and rollers can be cleaned with soap and water.
Proper disposal of left over paint is a challenge. Sometimes it can be recycled: Old paint may be usable for a primer coat or an intermediate coat, and paints of similar chemistry can be mixed to make a larger amount of a uniform color.
To dispose of paint it can be dried and disposed of in the domestic waste stream, provided that it contains no prohibited substances (see container). Disposal of liquid paint usually requires special handling and should be treated as hazardous waste, and disposed

of according to local regulations.

Cow Dung and Its Uses

Cow dung, which is usually a dark brown color (usually combined with soiled bedding and urine), is often used as manure (agricultural fertilizer). If not recycled into the soil by species such as earthworms and dung beetles, cow dung can dry out and remain on the pasture, creating an area of grazing land which is unpalatable to livestock.
In many parts of the developing world, and in the past in mountain regions of Europe, caked and dried cow dung is used as fuel.
Dung may also be collected and used to produce biogas to generate electricity and heat. The gas is rich in methane and is used in rural areas of India and Pakistan and elsewhere to provide a renewable and stable source of electricity.
In central Africa, Maasai villages have burned cow dung inside to repel mosquitos. In cold places, cow dung is used to line the walls of rustic houses as a cheap thermal insulator. Most of villagers in India spray fresh cow dung mixed with water in front of the houses to repel insects. It is also dried into cake like shapes and used as replacement for firewood.

Cow dung fuel of Bangladesh

Cow dung is also an optional ingredient in the manufacture of adobe mud brick housing depending on the availability of materials at hand
A deposit of cow dung is referred to in American English as a “cow chip,” or less commonly “cow pie,” and in British English as a “cowpat” When dry, it is used in the practice of “cow chip throwing” popularized in Beaver, Oklahoma in 1970. On April 21, 2001 Robert Deevers of Elgin, OK set the record for cow chip throwing with a distance of 185 feet 5 inches. Continuing with our series on the advantages offered by a Land & Cow based developmental model, this time we focus on one often neglected cow produce – manure! Manure or cow dung as called in India, finds its use in various places in traditional Indian culture. Manure is known in many Indian languages as go-var; go meaning cow and var meaning boon. It indicates how much the traditional Indians revered this excrement. Even the sacred texts of India, the vedas, which condemn all forms of excrements as abominable, hail cow dung as all auspicious. So much so that one finds is use in many sacred ceremonies and worship. So what’s so special about cow dung?
From a pure utility perspective, cow dung is one of the best forms of natural fertilizer. Application of cow dung for soil enrichment is an age old agricultural practice which was lost post introduction of chemical fertilizers. With rising demand for chemical free food and growing acceptance of organic farming, cow dung forms a very important link in chemical free farming.
Another growing trend is the use of cow dung in producing biogas, a cheap alternative source of energy that can be used as a fuel for cooking or to even produce electricity. Researchers at Hewlett Packard Co.’s HP Labs have found ways to power their data servers using cow manure. So its not just milk and food, but cows can even help us power our laptops and ipods!
But how about putting some cow manure all over your house? Sounds yucky, well its not really so, cow dung plasters are commonly found in many Indian homes. Cow dung, also hailed for its anti-bacterial properties, is the best natural disinfectant. In any typical Indian village it not uncommon to find the entire floor of the house coated with some fresh cow dung paste. Cow dung mixed with lime is also used to coat the walls of cob houses. Recent research findings from independent groups in University of Bristol and Sage college in Troy, NY, show cow dung to be an excellent mood enhancing agent. Cow dung contains a bacteria Mycobacterium vaccae, which activates a group of neurons in the brain that produce serotonin – a neurotransmitter that contributes to feelings of well being and happiness. So the next time you’re feeling depressed try walking into a cow barn and get a lungful of the fresh fragrance of cow dung.
Well the benefits do not end here, in the next article read how cow dung is being used to make various cosmetics and lifestyle accessories.

Why Cowdung is Used In The Paint?

1. Improves air quality up to 50%
2. Antiseptic in nature
3. Heat Resistant
4. Cost effective (7-10 rs. per piece of dung cake)
5. Dried dung is odorless
6. Cow Dung acts as an insulator, keeping heat out in the summer and holding it inside in winter.
7. Not only is it free from bacteria, it does a good job of killing it.
8. Gomaya (dung) is considered very valuable and used to purify the environment.
9. Protects from UV radiations by keeping a check on them, as it has Radium present in it.
10. Cost of Paint is inversely proportional to the Cow dung Used.
11. Acts as a coolant, no need to use A/C Saves up to 40,000/-
12. Acts as an Insulator, keeping the house warm, discarding heaters.
13. The thinner smelt by the working men causes them artrio-pulmonary dieseases & mental harm etc.

Components Of Cowdung Paint

1. Binder

The binder, commonly called the vehicle, is the film-forming component of paint. Components listed below are included optionally, depending on the desired properties of the cured film. It holds the paint together.

2. Thinner

The main purposes of the diluent are to dissolve the polymer and adjust the viscosity of the paint. It is volatile and does not become part of the paint film. It also controls flow and application properties, and in some cases can affect the stability of the paint while in liquid state. Its main function is as the carrier for the non volatile components

3. Pigment and Filler

Pigments are granular solids incorporated in the paint to contribute color. Fillers are granular solids incorporate to impart toughness, texture, give the paint special properties, or to reduce the cost of the paint. Alternatively, some paints contain dyes instead of or in combination with pigments.

Procedure To Make The Paint

- Heat some skimmed milk (don't let it boil)
- Add about 3 teaspoons of vinegar (an acid) to the milk and stir slowly until the milk seperates into curds(solid sticky bits) and whey(clear liquid)
- Pour the curds and whey through a tea stainer and Collect the Curd.
- To the product, add a half Tea-Spoon of Sodium Bicarbonate
- You'll now have a sticky white substance called Casein, to be used as a binder in the paint.
- Now the following chemical reactions needs to be performed in the same sequence given below:
- Milk + Acetic Acid > (heat) Intermediate
- Intermediate + Sodium Bicarbonate > Casein
- Casein + Turpentine > Paint Base
- Intermediate (Paint Base) + Cow dung Paste> Paint
- Paint + Lapiz luzzili > Final product.

PIGMENT USED- Lapis Lazuli

Lapis lazuli or **lapis** for short is a deep blue semi-precious stone prized since antiquity for its intense colour. Lapis lazuli was mined in the Sar-i Sang mines and in other mines in the Badakhshan province in northeast Afghanistan as early as the 7^{th} BC. Lapis beads have been found at neolithic burials in Mehrgarh, the Caucasus, and even as far from Afghanistan as Mauritania. It was used for the eyebrows, among other features, on the funeral mask of Tutankhamen (1341–1323 BC).

At the end of the middle Ages, lapis lazuli began to be exported to Europe, where it was ground into powder and made in to ultramarine, the finest and most expensive of all blue pigments. It was used by some of the most important artists of the Renaissance and Baroque, including Masaccio, Perugino, Titian and Vermeer, and was often reserved for the clothing of the central figures of their paintings, especially the Virgin Mary.

Today mines in northeast Afghanistan and Pakistan are still the major source of lapis lazuli. Important amounts are also produced from mines west of Lake Baikal in Russia, and in the Andes mountains in Chile. Smaller quantities are mined in Italy, Mongolia, the United States and Canada.

Composition of the pigment

Lapis lazuli is a rock whose most important mineral component is lazurite (25% to 40%), a feldspathoid silicate mineral with the formula $(Na, Ca)_8(AlSiO_4)_6(S,SO_4,Cl)_{1-2}$. Most lapis lazuli also contains calcite (white), sodalite (blue), and pyrite (metallic yellow). Other possible
stituents: augite; diopside; enstatite; mica; hauynite; hornblende, and nosean. Some lapis lazuli contains trace amounts of the sulfur-rich löllingite variety *geyerite*.

Lapis lazuli usually occurs in crystalline marble as a result of contact metamorphism.

Color

The intense blue color is due to the presence of the trisulfur (S_3) radical anion in the crystal. An electronic excitation of one electron from the highest doubly filled molecular orbital (No. 24) into the lowest singly occupied orbital (No. 25), results in a very intense absorption line at λ_{max} ~617 nm.

Sources

Lapis lazuli is found in limestone in the Kokcha River valley of Badakhshan province in northeastern Afghanistan, where the Sar-e-Sang mine deposits have been worked for more than 6,000 years.[13] Afghanistan was the source of lapis for the ancient Egyptian and Mesopotamian civilizations, as well as the later Greeks and Romans. Ancient Egyptians obtained this material through trade from Afghanistan. During the height of the Indus valley civilization about 2000 BC, the Harappan colony now known as Shortugai was established near the lapis mines.

According to the Sorbonne's mineralogist Pierre Bariand's leading work on the sources of lapis lazuli in modern times, and to references in *Afghanistan's Blue Treasure: Lapis Lazuli* (2011) by Lailee McNair Bakhtiar, the lapis lazuli is found in "caves" not traditionally considered "mines" and the stone lapis lazuli is from the primary source of the Hindu Kush Mountains in Afghanistan's Kochka River Valley and not in Pakistan.

In addition to the Afghan deposits, lapis is also extracted in the Andes (near Ovalle, Chile); and to the west of Lake Baikal in Siberia, Russia, at the Tultui Lazurite deposit. It is mined in smaller amounts in Angola; Argentina; Burma; Pakistan; Canada; Italy, India; and in the United States in California and Colorado.

Alternatives

Lapis lazuli is commercially synthesized or simulated by the Gilson process, which is used to make artificial ultramarine and hydrous zinc phosphates. It may also be substituted by spinel or sodalite, or by dyed jasper or howlite.

Uses

Lapis takes an excellent polish and can be made into jewelry, carvings, boxes, mosaics, ornaments, small statues, and vases. It was also ground and processed to make the pigment ultramarine, widely used during the Renaissance in frescoes and oil painting. Its usage as a pigment in oil paint largely ended in the early 19th century when a chemically identical synthetic variety became available.

Future Scope Of The Project

Water Pipelines

The paint thus formed can be used in pipelines for saving water from getting evaporated.

There is a huge Loss of water due to evaporation. As India being a tropical country we have sunlight all the year round. Due to hot water in summers, as a result the power generated by water is less. In cold areas, the water may get frozen. Due to high temperature, the surface temperature decreases & the internal vibrations of molecules increase as a result of which they attack the turbine with less force. We can reduce the evaporation for more power generation. In summer, the water inside the pipes will be cool and hence, more power will be generated.

Moreover, as the Cow dung paint prevents the sunlight from coming in, Lakhs of liters of water is saved from getting evaporated.

In cold seasons, the paint keeps the water on normal condition and prevents it from freezing. Hence power generation won't be a problem in winters also.

Also, due to cheap cost and high durability, it is easily affordable.

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