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Production of Textcoat and Emulsion Paints Stainless For Youth Skill and Entrepreneurship Empowerment Program

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Abstract

The need and use of architectural protective coating in the building industry cannot be over emphasized. Paints of different varieties ranging from emulsion, textcoat to oil paints of different colours offer adequate protective coating and aesthetic values to buildings. Unfortunately the paint market is flooded with adulterated and poor quality paints the abysmal performance of the paint sector is blamed on adulteration and high costs of the raw materials for paint production. The local paint manufacturers in the bid of trying to maximize profit produce inferior and low quality paints. This paper, therefore, is aimed at investigating the quality of textcoat and emulsion paints produced in Nigeria and attempting to produce similar paints of international standards in the Building Materials Research Centre, Ebonyi State University, Abakaliki. Simples of the produced paints were subjected to standard laboratory investigations for quality assurance and the results were normal or standard. The paper recommends that such paints, manufactured using optimal mixes, should be employed for decorative and protective purposes.

Keywords: Emulsion Paints, Youth Skill, Entrepreneurship, Youth Empowerment

Introduction

Paint is any liquid, liquefiable or mastic composition which after application to a substrate in a thin layer is converted to an opaque solid film. Painting has been known to be one of the most important aspects of building construction. It covers the block work and concrete rendering (plaster) with attractive and beautiful colours, giving the building a high aesthetic value that makes it decorative clean and habitable. Paint is indispensable in building construction all over the world. Olowokande (2009) lamented over the challenges facing the paint industry in Nigeria. He reported that the contribution of the sector to the gross domestic product (GDP) has dropped drastically. This is as a result of weakening infrastructure and the burden imposed on the manufacturing sector by the poor power supply, government policies on tariff and port operations. There is an astronomical rise in the cost of raw materials for paint making. This has also led to the high rate of adulteration of paint products. The insecurity in Niger Delta hiked the price of crude oil; thereby worsening the situation. The increased demand of architectural protective coating has not improved on the performance of paint in Nigeria.

However, Fernandez (2009) reported that the current global paint and coating industry is doing its best to build a safer, greener and more sustainable world. He noted that industrial activity has a significant impact on economic and social development and the environment around the world. Also the global paint industry has been making the shift to more environmentally advanced technologies for more than fifty

years. Fernandez (2009) reported that today clean water based paint technologies are used around the world accounting for 70 percent of the total US paints and coating market while 30 percent are growing across Asia.

Abdullah (1997) reported that titanium dioxide which is a major ingredient in paint manufacturing is imported. Nigeria only provides 25% of the paint industry Kaolin and lime stone (calcium carbonate). Most of the chemicals needed for paint production in Nigeria are imported with the fright rates and import duties, increasing the prices of paint raw materials. Abdullah (1997) noted that Nigeria paint manufacturing has been highly dependent on foreign equipment, machinery and raw material partly sue to technological backwardness and the industrialization policies particularly import substitution, of the raw materials. In recent times, with the fluctuating economy people now appear to patronize locally made products, including paints produced with a high percentage of local raw materials.

According to Wikipedia (2009) paint could 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 power, and then baked at high temperature. This melts the powder and causes it to adhere (stick) 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 overall object being painted). This is commonly referred to as "powder coating" – an object. Emulsion paints could be grouped as interior, economy, standard and premium (Nigerian industrial standard No.151 2008). 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 commonly referred to as "spray painting" an object. The reasons for doing this include:

- The application mechanism is air and thus no solid object ever touches the object being painted;
- The distribution of the paint is very uniform so there are no sharp lines;
- It is possible to deliver very small amounts of paint;
- 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, other instruments, or body parts such as fingers. Paint application by spray is the most popular method in industry (Berendsen, 1989). In this, paint is atomized by the force of compressed air or by the action of high pressure compression of the paint itself, which results in the paint being turned into small droplets which travel to the article which is to be painted. Manually, rollers are used to apply paints to surfaces. Rollers generally have handles that allow for different lengths of poles which can be attached to allow for painting at different heights. Generally, roller application takes two coats for even colour. A roller with a thicker nap is used to apply paint on uneven surfaces. Edges are often finished with an angled brush.

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 alkyl-based emulsion paint can be extended by adding white spirit, similar glycols such as ethanol propylene glycol (ether) or commercial 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 may also be applied by flipping the paint, dripping, or by dripping an object in paint. Interior/exterior house paints tends to separate when stored, the heavier components settling to the bottom. It should be mixed before use, with a flat wooden stick or a paint mixing accessory; pouring it back mixing accessory;

pouring it back and forth between two containers is also an effective manual mixing method. Paint stores have machines for mixing the paint by shaking it vigorously in the can for a few minutes.

The opacity and the film thickness of paint may be measured using a drawdown card. Oil-based paints when dry tend to be very durable, washable, and long-lasting. Water based paints tend to be the safest, and easiest to clean up after the brushes and rollers can be cleaned with soap and water. It is difficult to reseal the paint container and store the paint well for a long period of time. It should be stored upside down, for a good seal. Storage should be in a cool dry place, protected from freezing. 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 colour. If it is necessary to dispose of paint, one approach is to dry it, either by leaving the lid off until it solidifies (which tends to work well only for quantities), or by pouring it into a disposable drying device, such as a piece of plywood surrounded by a lip. Once dry, the paint may be discarded with normal trash. Wet oil based paint should be treated as hazardous waste, and disposed off according to local regulations (Wikipedia 2009a, 2009b and 2009c).

Paint Failures in Nigeria: Paint failures can result from many causes. The most common failures include the following: **Alligatoring:** this refers to a coating pattern that looks like the hide of an alligator. It is caused by uneven expansion and contraction of the undercoat. Alligatoring can have several causes: applying enamel over an oil primer; painting over bituminous paint, asphalt, pitch, or shellac; and painting over grease or wax.

Peeling: Peeling results from inadequate bounding of the topcoat with the undercoat or the underlying surface. It is nearly always caused by inadequate surface preparation. A topcoat peels when applied to a wet, dirty, oily or waxy, or glossy surface and must be sanded before repainting. Also, the use of incompatible paints can cause the loss of adhesion. The stresses in the hardening film can then cause the two coatings to separate and the topcoat to flake and peel. Blistering is caused by the development of gas or liquid pressure under the paint. The root cause of most blistering, other than that caused by excessive heat is inadequate ventilation plus some structural defect allowing moisture to accumulate under the paint. A prime source of this problem, therefore, is the use of essentially porous major construction materials that allow moisture to pass through. Insufficient drying time between coats is another prime reason for blistering. All blisters should be scraped off, the paint edges feathered with sandpaper, and the bare places primed before the blistered area is repainted.

Prolonged tackiness: A coat of paint dries when it ceases to be "tacky' to the touch. Prolonged tackiness indicates excessively slow drying. This may be caused by insufficient drier in the paint, a low quality vehicle in the paint, applying the paint too thickly, painting over an undercoat that is not thoroughly dry, painting over a waxy, oily, or greasy surface, or painting in damp weather.

Inadequate Gloss: Sometimes a glossy paint fails to attain the normal amount of gloss. This may be caused by inadequate surface preparation, application over an undercoat that is not thoroughly dry, or application in cold damp weather.

Improper Application: This is usually controlled by the builder. It takes a lot of practice, but you should be able to eliminate the two most common types of application defects: crawling and wrinkling.

Crawling: Crawling is the failure of a new coat of paint to wet and form a continuous film over the preceding coat, this often happens when latex paint is applied over high gloss enamel or when paints are applied on concrete or masonry treated with a silicone water repellent.

Wrinkling: Wrinkling results when coatings are applied too thickly, especially in cold weather, the surface of the coat dries to a skin over a layer of un-dried paint underneath. Wrinkling can be avoided in brush painting, or roller painting by brushing or rolling each coat of paint as thinly as possible. In spray painting, you can avoid wrinkling by keeping the gun in constant motion over the surface whenever the trigger is down.

Chalking: Chalking is the result of paint weathering at the surface of the coating; the vehicle is broken down by sunlight and other destructive forces, leaving behind loose, powdery pigment that can easily be rubbed off with the finger. Chalking takes place rapidly with soft paints, such as those based on linseed oil. Chalking is most rapid in areas exposed to sunshine. In the Northern hemisphere, for example, chalking is most rapid on the south side off a building. On the other hand, little chalking takes place in areas protected from sunshine and rain, such as under eaves or overhangs. Controlled chalking can be an asset, especially in white paints where it acts as a self- cleaning process and helps to keep the surface clean and white. The gradual wearing away reduces the thickness of the coating, thus allowing continuous repainting without making the coating too thick for satisfactory service.

Checking and cracking: Checking and cracking are breaks in a coating formed as the paint becomes hard and brittle. Temperature changes cause the substrate and overlying paint to expand and contract. As the paint becomes hard, it gradually loses its ability to expand without breaking. This consists of tiny breaks in only the upper coat or coats of the paint film without penetrating the substrate. The pattern is usually similar to that of a crow's foot. Cracking is larger with longer breaks extending through to the substrate. Both result from stresses exceeding the strength of the coating. But whereas checking arises from stress within the paint film, cracking is caused by stresses between the film and the substrate. Cracking generally takes place to a greater extent on wood, due to its grain, than on other substrates. The stress in the coating is greatest across the grain, causing cracks to form parallel to the grain of the wood. Checking and cracking are aggravated by excessively thick coatings that have reduced elasticity. Temperature variations, humidity, and rainfall are also concerns for checking or cracking.

Production of Standard Text coat and Emulsion Paints Raw Materials and Equipment:

(a) Pigment
(b) Builder/vehicle
(c) Water
(d) Additives (solids and liquids)
(e) Mix basin (for at least 500 litres of paint)
(f) Electric mixer.

Production Method

(a) Place the mix basin in position and fasten it with the claws or clamps of the mixer.
(b) Fix the stainless steel impeller into the basin and pour some quantity of water into the basin.

(c) Switch on the mixer; using only a low speed at this point.
(d) Add the raw materials as required (liquids first)
(e) Increase the speed to the medium mark and allow materials to mix or blend for some time, say 20 minutes.
(f) Quickly add the thickener and increase the speed.
(g) Allow to blend for about I hour, adding pigment and water according to the desired colour and viscosity, respectively,
(h) Stop the process after a homogeneous mix and pour out the paint.

Table 1: Laboratory Results of Tests on Emulsion Paint Sample Produced By Researcher

Paint Code: 4046

Type of test	**Result**	**Remarks**
Plastic limit	40%	Normal
Particle size (Solute)	0.05 micron	Normal
Viscosity	Medium	Normal
Adhessibility	High	Normal

Source: Building Materials Research Centre, Ebonyi State University, Abakaliki 2009.

Table 2: Laboratory Results of Tests on Emulsion Paint Sample Produced By Researcher

Paint Code: 3040

Type off test	**Result**	**Remarks**
Plastic limit	32%	Normal
Particle size (Solute)	0.08 micron	Normal
Viscosity	Medium	Normal
Addressability	High	Normal

Source: Building Materials Research Centre, Ebonyi State University, Abakaliki 2009.

Discussions of Results

The samples of the paints were prepared for laboratory investigation, following the Nigerian Institute of Standards, NIS 267: 1989. The panels used,were also in accordance with NIS 273: 1990. All the tests were carried out at temperatures of 25 -29℃ and a relative humidity of 70-80%.
The pigments had suitable extenders, in appropriate proportions and the medium consisted of a *stable* synthetic *polymer dispersed in water with other suitable ingredients necessary to* satisfy the requirements. No caking, granulation, levering or colour separation was observed in paints. From tables land 2 it could be seen that the particle sizes were 0.05 and 0.08 microns, respectively, showing conformity *with the* standard of 0.075 microns (max/mum). The viscosities were also normal having a minimum of 6.0 poises at 25-29 ℃

The paints mixed readily with a minimum amount of foaming to a smooth and homogeneous state. The ph values of the paints were also normal (between 7.0 and 9.0). The plastic limits were also normal, having values of 40% and 32% respectively (see tables 1 and 2). The paints did not develop any offensive odour, even at temperatures of 48-52 ℃ for an appreciable length of time (say, 1 month). The paints had high drying properties, directly proportional to their adhessibilities. After applying a coat of paints on a glass panel, following NIS 273; 1990, giving a wet film thickness of approximately 50mm at standard test conditions, the paints were surface dry at the end of 20 minutes and were a/ready dry for recoating after 2 hours. The paints showed resistance to wet abrasion, which is also directly proportional to their adhessibilities. The high addressability values were proportional to the resistances to wet abrasion values of 59-101 cycles, (interior to economy grades). When exposed to high wet abrasion, no cracks colour fading or stain/dirt retention were observed. Some of the paints produced by some local industries do not conform to NIS standards since they possess a lot off defects.

Conclusion

From the fore-going, it could be established that the textcoat and Emulsion paints conformed to the Nigerian institute of standards (NIS) specifications and could be used for both decorative and protective purposes, instead of some of the poor quality paints that some industries manufacture. It could also be deduced that some of these manufacturers do not cooperate with the standard organization of Nigeria (SON) so as-to ensure good qualities of their products, since their products still exhibit some defects.

Recommendations

The Standard Organization of Nigeria should protect the integrity of the paints in Nigeria by ensuring no paint in the market is adulterated. The standard organization of Nigeria (SON) with the cooperation of the paint manufacturers Association of Nigeria (PMAN) should ensure that only MANCAP certified paints are sold in the open market in Nigeria.
The Standard Organization of Nigeria and the Paint Manufacturers Association of Nigeria should organize extensive outreach and educational programmes, seminars and workshops to educate the paint manufacturers on the latest and correct technologies and techniques of paint production. 4. A strong network of real professional painters and contractors should be built to bring quality products and services to the teaming customers. Research and development is one of the driving forces that keep the economy competitive and self-reliant while facilitating the efficient use of natural resources. There must be close link and cooperation between universities and the private sector with regard to research findings on paints. Research on paint must be supported by both the government and the industry through adequate funding. Information on

research and development must be made available to all relevant areas of the economy for adaptation.

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