Wrinkle Paint Versus Stoving Synthetic Enamel for Telecommunication Industry

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THE use of stoving synthetic enamel as a replacement for wrinkle paints in the telecommunication industry is discussed in this paper. Wrinkle paint with its decorative appearance and its ability to cover the material defects like dents, welding marks etc. has got the inherent defects such as non-uniform pattern, film softness, in-consistent shade and cost fluctuations etc. The approximate cost savings by this change over is 30 to 40%. With the advent of a large variety of resins synthetic enamel has attained a unique position in the finishing field with its improved corrosion resistance, gloss, hardness and consistent shades. It is observed that the plain synthetic enamel is superior to the wrinkle paint. In I. T. I. the total annual savings by the replacement of Wrinkle Paint has come to approximate Rs. 2 lakhs.

WRINKLE finish is a decorative finish, forming folds of similar size evenly distributed over the whole surface. This is a special type of finish which is formed by Oleoresinous or alkyd type resins. Raw and blown China Wood Oil and large variety of extenders are also used to get a desirable type of the wrinkle pattern. These are widely used in articles of commercial importance like typewriters, time-clocks, office equipments, home radios, air-conditioning units, telecommunication equipments, etc. The most important advantage of this type of finish is in disguising the metal imperfections. Wrinkle finishes are normally of stoved type[1,2].

Synthetic Enamel is a type of paint which is characterised by an ability to form an especially smooth film. Enamels are widely used in industrial finishing because owing to the finer pigment dispersion and good gloss, decorative as well as protective demands are met. Since enamels are resistant to mechanical abuse, they are used to finish metal products and equipments used in the home, office and factory. Automotive, electrical and telephone industries are particularly good customers of this finish. With the advent of varieties of resins, synthetic enamels of effective characteristics can be made to meet the diversified needs of various industries.

We have come across a series of problems when we are using wrinkle paint (light grey, Aircraft grey and black shades) viz. (1) non-uniform pattern (2) film softness & (3) Inconsistent shade Further, the sources for this special type of paint are only two or three. Hence, getting uninterrupted supply of this paint is difficult. This is also due to raw-material shortage for manufacturers. Essential raw-materials like cobalt driers, china-wood-oil are only to be imported. Hence, price fluctuation of this special paint is frequently being experienced by us. On comparison with our wrinkle paints, the synthetic enamel finish has better appearance in the Telephone Exchanges. Hence, we have taken up this work to ascertain the properties of wrinkle paint as well as synthetic enamel and decide for our bulk requirement (7000 litres per annum approx.) of the Process Shops for better decorative purposes, properties and also to ensure unhindered supply of the paint/enamel for the telecommunication equipments such as Crossbar covers and telephone bell box covers, base assembly etc.

EXPERIMENTAL AND DISCUSSIONS

In a number of visits to various Crossbar Telephone exchanges in the country, we have observed that there is variation in the shade from cover to cover in the case of wrinkle finish and also it is observed that dust is collected on the wrinkle painted covers. This is giving a poor appearance to the equipment inside the Exchanges. There is no standard specification for evaluation of the properties of wrinkle paint and there are no standard methods for conducting tests. However, tests like stoving schedule, pattern formation, nail hardness, and shade are generally conducted for quality evaluation ; though these are not standard method of testing. In our opinion, testing these characteristics alone are not adequate for the life/quality of the special type of paint. In view of the above,

TABLE 1A

Comparative study of the properties of stoving synthetic enamel dark admirality GREY as per ITI SPEC. D675A issue 4

Spec. Limits	A	B	C	D	E
1. Stoving Schedule 120 C-140 C for 25-30 mins.	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Satisfactory
2. Consistency 80 Secs-Ford cup B-4 25°C-28C°	90 secs	65 secs (sample I) 90 secs (revised sample)	100 secs (I sample) 95 secs (revised sample)	74 secs (I sample) 80 secs (revised sample)	90 secs (I sample)
3. Finishing 90% Gloss-Black Standard	90%	90%	90%	90%	90%
4. Colour of the Dried Film D.A. Grey shade No. 632, IS : 5/1978	O.K.	O.K.	O.K.	O.K. (I sample) Not O.K. (revised sample)	Not O.K. (I sample)
5. Fastness to light 200 hrs—No undue change in colour	O.K.	O.K.	O.K.	O.K.	—
6. Scratch Hardness 1400/1500 gms minimum	1300 gms (Minimum side)	1500 gms	1800 gms	1400 gms	1500 gms (I sample) 1000 gms (revised sample)
7. Flexibility & Adhesion No visible damage or detachment of the film	Satisfactory	Satisfactory	Satisfactory	Satisfactory	—
8. Stripping Test Free from jagged edges	Satisfactory	Satisfactory	Satisfactory	Satisfactory	—
9. Humidity Test — No signs of corrosion at the end of 250 hrs on a composite coating system	—	—	Not Satisfactory	—	—
10. Resistance to Heat : Second cycle 120 C±5 C for 1 hr. No sign of cracking, blistering or change of shade.	Satisfactory	Satisfactory	Satisfactory	Satisfactory	—
11. Resistance to water — No signs of deterioration and retention of 60% of original Gloss after 48 hrs at room temp	Satisfactory	Satisfactory	Not satisfactory Bubbles and Pin holes observed (revised sample)	Not satisfactory Satisfactory (revised sample)	—
12. Tape Test — No stain or permanent print on the painted film	Satisfactory	Satisfactory	Satisfactory	Satisfactory	—
13. Multicross Test — Intercoat adhesion and adhesion to base metal shall be satisfactory (composite coating)	Satisfactory	Satisfactory	Satisfactory	Satisfactory	

Note : Sl. Nos. 3 to 12 – tests conducted after curing them at room temp. for 24 Hours.

TABLE 1B

Comparative study of the properties of synthetic enamel stoving Satin Black Paint

Characteristics of Stov. Syn. En. Stain Black Paint	F	G	H	I
1. Stoving Schedule : Shall become hard after stoving at 120°C 130°C for 25 to 30 mins.	Satisfactory	Satisfactory	Satisfactory	Satisfactory
2. Consistency : Initial viscocity min. 80 secs when measured with Ford cup No. 4 at 25°C-28°C Consistency shall be smooth, uniform and suitable for spraying after thinning, and free from gritty particles.	90 secs smooth, uniform and free from gritty particles	85 secs smooth, uniform and free from gritty particles	80 secs smooth, uniform and free from gritty practicles	90 secs smooth, uniform and free from gritty particles
3. Finishing : Satin Finish or Egg shail Finish } having no gloss	Satin Finish No gloss-O.K.	Satin Finish No gloss-O.K	Satin finish having a gloss of (30%-Not O.K.) (Semi-glossy)	Satin finish No gloss-O.K.
4. Colour of Dried Film : Stain Black as per our stadard.	Satin Black as per our standard (OK)	Satin Black as per our std. (OK)	Satin Black is not as per our std. (NOT OK)	Satin Black as per our std. (OK)
5. Scratch Hardness : Min. 1400 gms when tested as per 1S : 101-1964 Cl. 15.	1400 gms	1400 gms	1400 gms	1400 gms
6. Flexibility and Adhesions : No visible damage or detachment of film from the substrate should be visible when tested as per 1S : 101-1964 Cl. 16.	Satisfactory	Satisfactory	Satisfactory	Satisfactory
7. Stripping Test : Free from jagged edges when tested as per Cl. 17 of 1S : 101-1964.	Free from jagged edges	Free from jagged edges	Free from jagged edges	Free from jagged edges
8. Resistant To Heat : The painted panel after initial stoving and cooling to room temp. shall be heated at 120°C±5°C for one hour. When examined after cooling, the film shall not show any type of cracking, blistering and change of shade in comparsion with the approved panel.	Satisfactory	Satisfactory	Satisfactory	Satisfactory
9. Resistant to Water : The film shall not show any signs of deterioration and shall not develop any blisters and adhesion and flexibility etc. shall not be affected when tested as per cl. 23 of 1S : 101-1964.	Satisfactory	Satisfactory	Satisfactory	Satisfactory
10. Tape Test : No stain or permanent print on the paint film shall be visible when tested as per Appendix F of IS : 6125-71.	No stain or permanent print is visible	No stain or permanent print is visible	No stain or permanent print is visible	No satin or permanent print is visible
11. Multicross Test : Intercoat adhesion and adhesion to base metal shall be satisfactory when tested as per Appendix H — IS : 6125-1971.	Satisfactory	Satisfactory	Satisfactory	Satisfactory

we have taken up the project of replacing the wrinkle finish by plain synthetic stoving enamel, to have well defined properties as per our requirements. For this purpose we have studied a number of salient properties other than the normal ones of synthetic enamel (from various sources) as below :

(1) Fastness to light — Standard panels were prepared and exposed to ultraviolet light for 200 Hrs. No undue change of shade/colour of the paint film shall be observed.

(2) Scratch Hardness —This property was tested on the standard panel so as to get a minimum film hardness of 1400/1500 gms in automatic sheen hardness testing instrument.

(3) Protection against corrosion —Panels were prepared on a phosphated M. S. Sheet with undercoat. These panels were exposed to 100% humidity at 42-48°C for 250 hours in a 'Brabender' Humidity chamber. The metal surface shall not show any signs of corrosion at the end of this test.

(4) Resistance to water —Standard panels were kept in water for 48 hours. The film shall not develop blisters, bubbles and adhesion & flexibility shall not be affected. 60% of the original gloss shall be maintained.

Table IA and IB show the physical properties of stoving synthetic enamel (light grey, Dark Admirality grey and satin black shade).

The most important disadvantages of this type of finish is the inability to cover or mask the raw material defects like pits, dents, welded portions etc. processing defects like orange peel sagging, dry spray pattern etc. are also observed.

Table II gives the physical properties of the wrinkle paints (Air-craft grey and black shade).

The important and unique disadvantages are already discussed initially. On the aesthetic point of view, this finish attracts dust and mar the appearance. Other than this defects like uneven wrinkling, faulty patches, heavy edges, are also observed. As regards corrosion protection point of view, wrinkle finishes are definitely inferior to synthetic enamels. As there are no standard methods for tests for checking the adequate properties of wrinkle paints, the same standards adopted for plain synthetic enamels were followed and found that properties like resistance to water, heat, humidity and colour fastness were not satisfactory.

Photographs (1-7) of different types of wrinkle pattern are shown with details :



Fig. 1 Correct wrinkle pattern—Black shade

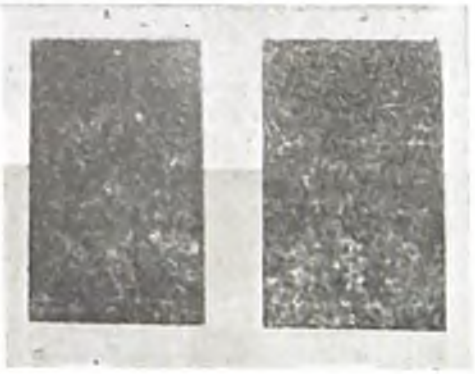


Fig. 2 Fig. 3

Fig. 2 Fine wrinkle pattern—Black shade

Fig. 3 Medium wrinkle pattern—Black shade

On comparision with wrinkle paint, synthetic enamel has definitely got number of advantages like uniformity and consistency in appearance, better corrosion protection, high gloss, better flexibility and adhesion, etc. The cost of wrinkle paints are always fluctuating on the higher side, probably this may be due to import of certain raw material required for the manufacture of this paint.

TABLE II
Wrinkle Paint

	X	Y	Z
1. Stoving Schedule	120°C – 1 Hr	120°C – 30'/40'	120°C – 30'/40'
2. Shade as per standard shade	Not Satisfactory	Not Satisfactory	Satisfactory
3. Wrinkle Pattren (Medium wrinkle)	Not Satisfactory (Fine wrinkle)	Not Satisfactory (Coarse wrinkle)	Satisfactory Satisfectory
4. Nail Hardnss	Not Satisfactory	Satisfactory	Satisfactory
5. Risistant to heat	Not Satisfactory	Satisfactory	Satisfactory

Note : Source Y & Z have withdrawn product from the market

Plain synthetic enamels are not having such fluctuation in cost. The cost is cheaper than wrinkle paint approximately 30 to 40% cheaper and also different standard sources are available in the country to offer quality material at competitive rates as per our requirements. Thus, there is a saving of about Rs. 2 lakhs to our industry and this is a recurring saving

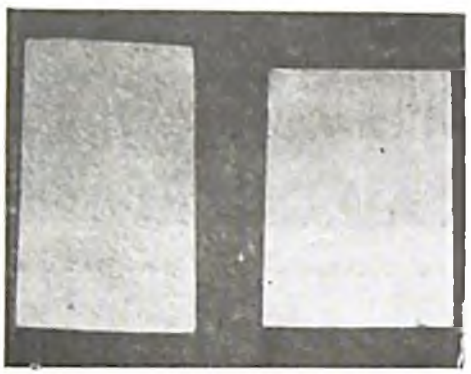


Fig. 4 Fig. 5

Fig. 4 Medium wrinkle pattern—Air-craft grey shade
Fig. 5 Very tine wrinkle pattern—Air-craft grey shade

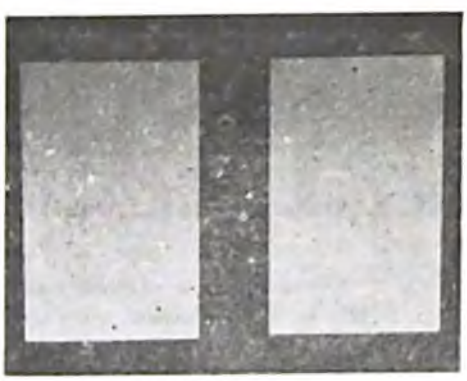


Fig. 6 Fig 7

Fig. 6 Patchy wrinkle pattern—Air-craft grey shade
Fig. 7 Fine wrinkle pattern—Air-craft grey shade

It may be pointed out here that among the synthetic enamels, darker shades are always superior to lighter shades for long term use. We have noticed that the tendency for colour change is more evident in lighter shades than in darker shades. Thus we have established that dark admirality grey is superior to light grey synthetic enamels in colour fastness though both are belonging to the same specification. But our customers' requirement is only light grey shade.

CONCLUSION

The above advantages in favour of the plain synthetic enamel clearly indicate that propertywise and costwise it is definitely better than the wrinkle paint. We have already switched over to the plain synthetic enamle with the approval of our customers viz. Posts & Telegraphs Department.

REFERENCES

(1) W. V. Fischer, Paints and Varnish Technology (1948) Reinhold Publishing Corporation, New York.

(2) Manfred Hess, Paint Film Defects (1958) Chapman and Hall Ltd. London.