1961-62

Paint Technology Course

Glidden Eastern Region

WHITE PIGMENTS

There are significant differences in physical properties of the various white pigments. The paint formulator must fully recognize these differences in order to use the pigments most efficiently.

The low bulking value for lead pigments (W-1, W-104) is an economic disadvantage, since materials for paint are purchased by the pound and sold by the gallon. The high bulk of the titanium-calcium pigment (W-214, W-232, W-179, W-180) is one of the advantages of this material when used in paints which require extender pigments. The oil absorption of white pigments is in the low to medium range. In some respects this situation is fortunate, because a higher per cent of pigment is required for white paints than for colored paints.

A very important difference among white pigments is their variation in refractive index and corresponding hiding power. It is well known that hiding power is a function of the difference in refractive index of the pigment and the binder and the particle size of the pigment. Most of the white pigments (especially some titaniums) are produced in the optimum particle size range (0.3 microns) for maximum light scattering. Smaller particles are transparent, larger particles are hard to grind and give lower gloss.

The lead pigments (W-1, W-104) are somewhat larger than optimum size, which detracts further from their hiding power. The three white pigments, white lead carbonate (W-104), zinc oxide (W-33, W-219, W-172), and titanium dioxide (see chart), illustrate a fundamental property of pigments, namely their degree of chemical reactivity with the vehicle and with the acidic compounds which form in the film as it dries and ages. White lead and zinc oxide are reactive pigments, titanium dioxide is a non-reactive pigment. The reactive pigments combine with free fatty acids in the vehicle, and with acids, such as formic acetic, and propionic which are formed as oxidation decomposition products in the dry film to produce the corresponding lead and zinc soaps or salts. The non-reactive pigment (titanium) does not combine with the free acids. Reactivity with free acids formed in the paint film affects the hardness, flexibility, coater resistance, gloss, and durability. White house paints are made with combinations of reactive and non-reactive pigments to obtain optimum properties.

Most architectural white paints and enamels tend to discolor or "yellow" to varying degrees on agin. In the dark, this "yellowing" may be considerable. The primary cause of yellowing is the formation of color bodies due to oxidation of the oil or other unsaturated components in the binder. About 10% of zinc oxide reduces or delays this yellowing. Zinc oxide gives the best protection of any pigment from the effects of sunlight.

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Extended pigments such as titanium-calcium pigment, although they are used in low cost enamels, are used chiefly in paints like flat wall finishes which require high pigment volume concentration to reduce the gloss. The leaded zinc oxides are used in exterior house paints as an economical source of both lead and zinc.

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F. B. ROBINSON