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PAINT PROGRESS

HORSE HEAD PRODUCTS

INCREASED RESEARCH ON HOUSE PAINT PAYS OFF IN COATINGS WITH LONGER SERVICE LIFE

Review Shows How Better Understanding of Complex Weathering Process Determines Most Effective Pigment Combinations

HOMEOWNERS are benefiting from healthy competition within the paint industry to develop exterior house paints that stay whiter, last longer and are easier to repaint, Sidney Werthan told students of the class in paint technology at Wayne University, Detroit, Michigan.

S. Werthan

Mr Werthan, member of The New Jersey Zinc Company's paint research staff, points out that, while no one pigment combination has met with universal acceptance by all paint manufacturers, general agreement on certain formulation principles has resulted in a rapidly increasing number of paints that give the consumer better service.

FORMULATION TRENDS

Compared with prewar formulations, many of the 1948 products rate higher in hiding power, are lower in lead content and are based upon vehicles that contain both raw linseed oil and heat-treated oils. The outlook is for a continuation of these trends

A more exact knowledge of how pigments and pigment combinations function in a paint film is the outstanding accomplishment of paint technology of the past decade, according to Mr. Werthan Seen in their proper perspective as building blocks which function chemically as well as physically in a protective coating film, pigments now can be proportioned to meet specific requirements at will.

Meanwhile, a better understanding of how raw and heat-treated oils may be combined more advantageously in practical paints has had important consequences. Heat-treated oils, which have larger molecules, are slower to disintegrate during the weathering process and permit closer control of the penetrating properties.

Some of the pigment building blocks are more important than others, but all play essential roles in meeting combined technical requirements and consumer preferences. In a detailed analysis published in OFFICIAL DIGEST of the Federation of Paint and Varnish Production Clubs, Mr Werthan reviews the methods paint technology has used to translate the findings of fundamental research on single pigment paints into practical coatings based upon combinations of chemically active and chemically inactive pigments.

NEED HIGHER HIDING NOW

Although these single pigment paints described by Mr. Werthan and reviewed below are for the most part impractical in themselves as coatings for the consumer, they disclose the essential strong points and weaknesses of each base material, thus paving the way to selection of the best combinations.

Titanium dioxide is valuable in paints

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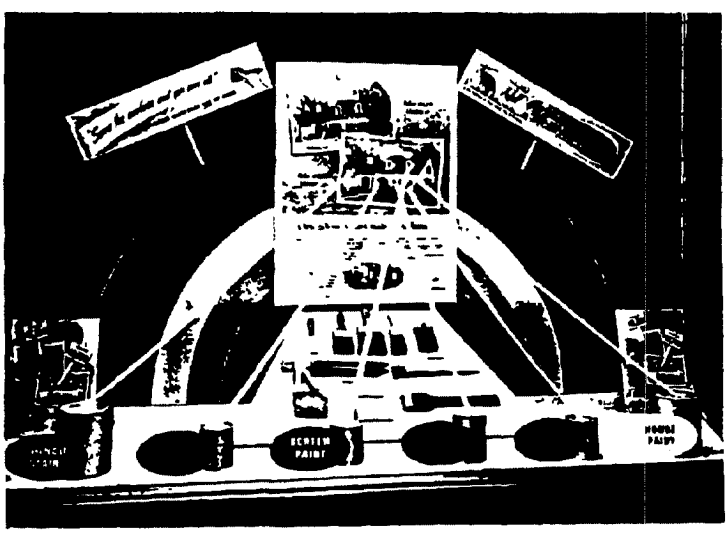

Through displays similar to this, paint dealers and the paint industry are stressing value of planned painting programs.

HOUSE PAINTS

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for its high opacity and chemical inertness Emphasizing the present importance of opacity to the consumer, Mr. Werthan said

"When lead and zinc oxide were the only available white hiding pigments, two or three dollars paid a painter for a day s labor and anything less than three coats of paint was heresy Sufficient lead and zinc could be put in white paint to provide ample hiding with three coats. But today, when two-coat painting is general practice and even one-coat painting is being promoted and painters receive as much by the hour as their grandfathers did by the day, the opacity obtained with lead and zinc must be reinforced with higher hiding pigments such as titanium and zinc sulfide."

SELF-CLEANING COATINGS

Two crystalline forms of titanium dioxide — anatase and rutile — are available to the paint industry. Both provide only limited protective action for paint oils and must be combined with chemically active pigments for best results.

Because anatase titanium does not form a strong mechanical bond with the vehicle, paints based solely upon this pigment weather too rapidly by chalking and erosion. However, this process, when properly controlled, through use of zinc oxide, is largely responsible for the "self-cleaning" properties of present-day coatings.

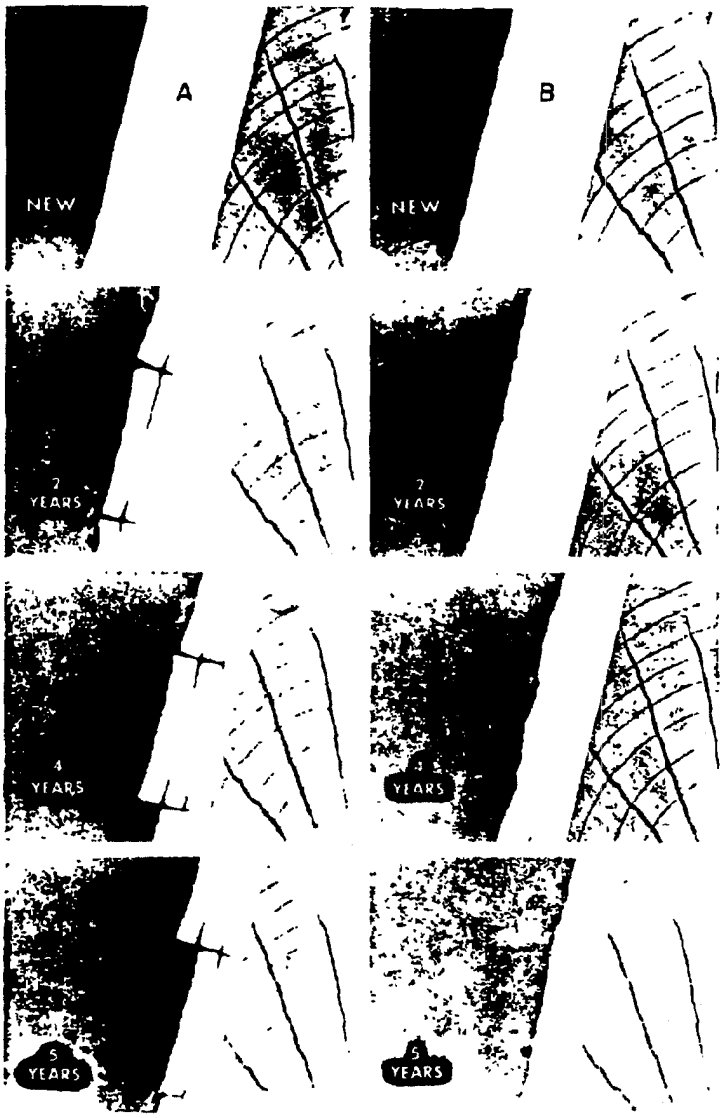
Rutile titanium pigment films erode at a slower rate, and do not stay as bright as anatase. As with anatase, the mechanical bond between pigment and vehicle is weak. However, rutile is superior to anatase for making tinted paints

PROPERTIES OF ZINC OXIDE

When a paint is exposed to weather, the vehicle is under attack by destructive ultraviolet rays in sunlight. Unless checked, these rays produce progressive oxidation and disintegration of paint oils, Mr Werthan said Fortunately an effective barrier against these rays is available in zinc oxide, which is unique among white pigments in being opaque to ultraviolet light.

Zinc oxide also boosts the resistance of paints to unsightly mildew growth, Mr Werthan went on. A reaction that takes place between zinc oxide and certain vehicle constituents results in burr-shaped soaps These burr-shaped soaps form strong mechanical bonds that reinforce coatings. However, paints composed entirely of this pigment are too tough and glossy to permit chalking and erosion at the desired rate.

Where traces of acidic gases are present in the atmosphere, surface particles of zinc oxide present in house paint films tend to form soluble salts or soaps which, with rain, act as cleansing agents



Present-day exterior house paints, "B," stay cleaner, leave a sounder foundation for repaint jobs than coatings, "A," of former years. Magnified cross-section drawings showing the weathering process are from The New Jersey Zinc Company's motion picture, "The Paint Film."

Lead pigments have declined in importance as white hiding materials. Today, their chief value is in their ability to form reinforcing lead soaps by reacting with paint oils, Mr. Werthan reported. These soaps are softer and more plastic than zinc soaps.

Lead pigments are introduced into exterior house paints either as basic white lead carbonate or as basic sulfate of white lead present in leaded zinc oxides Because they are darkened by sulfide fumes, lead pigments are not used in modern "fume proof" paints.

White lead sulfate films are weaker than those of basic carbonate Although they do not develop the visible checking

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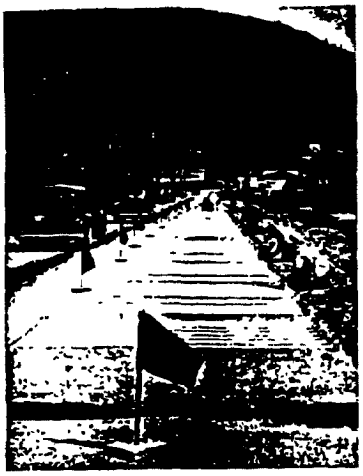
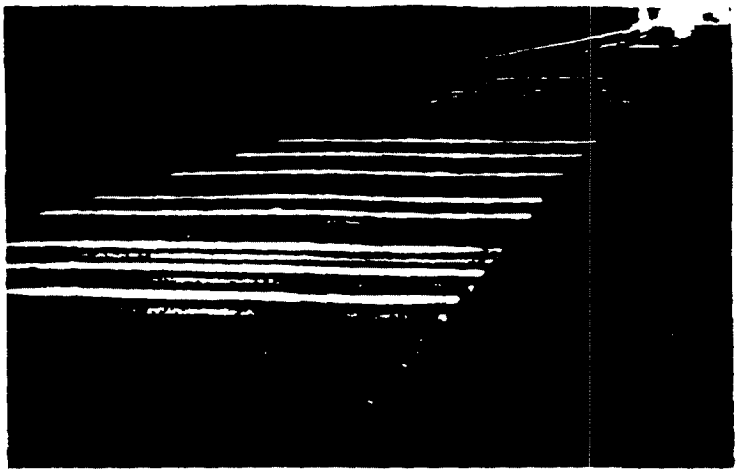


Numbering of paints was followed by flow of pavement-pounding trucks.



Night photo of glass-beaded stripes was taken under auto headlights. The brighter stripes are the beaded ones. In daylight, reverse is true.

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Pigment combinations used in the white paints included varying percentages of zinc oxide in zinc sulfide and titanium pigment paints; comparisons of various grades of lithopone; comparisons of lithopone, titanated lithopone and barium-base Cryptone*.

Also, comparison of anatase, rutile, barium-base, and calcium-base titanium dioxide pigments. In the yellow paints, varying ratios of lithopone, with or without zinc oxide, to yellow pigment are being studied.

Throughout the duration of the road tests, periodic ratings of the stripes for surface dirt collection, color change, wear, and day and night visibility are obtained. *Improved photographic techniques* play a vital part in recording results for future study with results of past years, as well as for demonstration to highway engineers who are not able to visit the scene of these tests.

To supplement the Route 309 programs, tests in thirty-two states and sixteen cities, either directly under the supervision of New Jersey Zinc Company investigators or in cooperation with interested traffic departments, have been conducted in past years to "prove in" formulations on other types of surfaces, such as bituminous paving, brick, oiled roads and even granite block surfaces

* Reg. Trade Mark.

INCREASED RESEARCH ON HOUSE PAINT PAYS

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characteristic of the latter, failure to the wood is more rapid due to an eroding process that takes place. As a result of this process, exposed layers of film flake off in tiny particles, taking surface dirt with them.

Zinc sulfide pigments weather by gradual erosion and possess good cleansing properties. They do not react chemically with the vehicle. However, they are "oleophilic," which means that they form a good mechanical bond with oils. In white paints, the discoloration of the film caused by copper metal is more severe with zinc sulfide than with other white pigments. In tinted paints, zinc sulfide pigments rate second only to zinc oxide in tint retention, Mr. Werthan declared.

Extender pigments in general use include siliceous inerts — fibrous magnesium silicate, mica and silica — as well as calcium sulfate, and several types of calcium carbonates. As a group they are chemically inert, except that calcium sulfate and calcium carbonate may show some soap formation. They form weak mechanical bonds with paint oils.

Modern paint formulation recognizes these products not only as aids in adjusting paints to correct pigment volume when high strength opaque pigments are employed, but as materials useful in themselves for modifying the weathering process in the direction of erosion, Mr. Werthan reported. This is particularly true of fibrous magnesium silicate and waterground mica because of the relatively large sizes and shapes of their particles.

MICA HAS SPECIAL PLACE

Mr. Werthan singled out water-ground mica as an extender pigment that warrants separate consideration. "Like other siliceous inerts," he said, "it develops practically no hiding and produces weak films. But because of its thin laminar particles, it apparently protects and reinforces the film. While other inert-linseed oil (single-pigment) films disintegrate within a year when exposed to weather, the mica film maintains its integrity for several years."

Although a mass of information has been accumulated regarding the behavior of individual pigments, there is no one neat solution when it comes to balancing the good and bad points of these pigments into mixed paints for the consumer, Mr. Werthan emphasized. Whether a paint is to be white or tinted has an important bearing on the combination to be selected.

The type of service also has to be taken into account. So do such factors as ease of manufacture, stability of paint in the can during storage, as well as consistency, brushing, leveling, drying, opacity, gloss, color and others.

WHITES AND TINTS DIFFER

The most popular white paint formulations today contain a combination of anatase titanium dioxide, white lead, zinc oxide and extender pigments. Fume-proof white paints consisting of titanium dioxide, zinc oxide and extender pigments are growing in popularity.

In tints where a higher degree of chalk resistance may be required, instead of anatase titanium, rutile titanium dioxide or a zinc sulfide pigment may be used Good tint paints also are prepared using white lead and zinc oxide as the opaque white pigments.