ings Industry Trends

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iave been those laws and regulations which limit the toxic content in paints, particularly lead. The first voluntary provision affecting paints intended for use on children's toys, furniture and exterior surfaces was issued in 1955 by the American National Standard Institute. Called the Voluntary Standard Z66-1, it limited the lead content to one per cent on the dry paint film as well as one per cent soluble barium and 0.05 per cent antimony, arsenic, cadmium, mercury and selenium—taken individually or—in total on the dry paint film.

Throughout the 1950s and 1960s, states such as California, Connecticut, Illinois and Kansas and major cities, including Baltimore and New York, adopted control laws limiting lead content of dry paint film for surfaces exposed to children.

Since then, however, increasingly stringent laws have been passed by various states and municipalities. A recent Chicago law, for example, not only restricts the presence of lead to 0.06 per cent on the dry film but also limits the amount of antimony, arsenic, cadmium, mercury and selenium to 0.05 per cent individually or

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the formulations are left alone. Thus, if the formulation already contains calcium or zirconium in addition to lead, the amount already present in the formulation is to be added to the amount recommended as a lead drier replacement. In oil-containing house paints, some additional cobalt or manganese may have to be used, but precautions against wrinkling may be necessary.

For loss-of-dry on aging in the can, several companies are making lead-free loss-of-dry agents. Some of these seem to be quite satisfactory. Manufacturers of these agents can normally advise the coatings manufacturer how much to use for different pigments and colors. Though more expensive, some of these do a better job than litharge or other lead-containing agents. The problem of loss-of-dry on aging can be more easily solved than that of lead drier substitution.

Mercury: We don't know the final decision by the committee appointed to determine allowable levels of mercury in paint. They may decide on a percentage which, for practical purposes, would completely eliminate mercury from paints. However, there is the possibility they may allow a level which, though very low, would still permit its use as a preservative for can stability. It may even be that after the committee examines the facts in the case, they will adopt a percentage high enough to permit its use both as preservative and as a fungicide.

Mercury in paints performs three functions:

First, and probably most important, it acts as a preservative. It does so by either killing or preventing the growth of microorganisms which would cause putrefaction with resultant bad odor, gas formation, etc. There are many non-mercurials being offered to perform this function. At the last convention in Detroit, the Chicago society presented a paper in which they presented the results of their tests with 13 commercial non-mercurial preservatives in different latex paints. They found four to be generally satisfactory. We can therefore manage with a non-mercurial if our interest is strictly as a preservative.

By far, the greatest amount of mercury is being used as a fungicide, to prevent the discoloration of the surface of the film. Sometimes fungi grow into, and help in the destruction of the film itself. This is true for both water and solvent-based paints. At present there is no non-mercurial that will do the job of mercury as both a fungicide and a mildewcide for all types of paints. Some of the available products will do a satisfactory job in oil or solvent-based paints. However, they are unsuitable in water-based coatings because they hydrolyze. Others are suitable only in P.V.A.'s, since they are unstable in the higher pH of the acrylics. Still others require the use of zinc oxide to make them effective. This may present problems, since not all latexes are stable with zinc oxide. If necessary, however, and with proper modifications, a fairly satisfactory non-mercurial fungicide can be used.

The third problem is that of enzymes—chemicals developed by bacteria and fungi, that tend to degrade cellulosic thickeners into simple sugars. This can cause a viscosity drop large enough to make the paint unusable. At present there is no really good non-mercurial enzyme inhibitor. The only way to alleviate this problem is by much improved housekeeping. The tanks and mixers must be kept clean, spattered paint must be removed so as to prevent crust formation, and everything possible should be done to keep the equipment sterile.

This, then, is the story, as we know it today, of the elimination of lead and mercury from surface coatings. There is no perfectly satisfactory substitute for either. However, if we are willing to spend more money, reformulate as necessary, take the proper precautions, and be less critical of results, we can minimize the disadvantageous effects of the new regulations.

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TRADITIONALLY, pigments people have viewed the world of color in shades of chrome yellow and molybdate orange. Inexpensive and durable, these pigments have always been regarded as the workhorses of our industry. But, based on the growing volume of environmental control-public health legislation, it appears that within the next few years, the "usable" applications for chrome yellow and molybdate orange will be severly limited and that organic pigments will supersede them.

Heading up the bulk of this legislation

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in total for all paints used on exterior film surfaces exposed to children.

The momentum generated by early legislation has increased steadily and a campaign against all heavy metals, not just lead, seems inevitable. The Federal Toxic Substances Control Act of 1972 (enacted by the Environmental Protection Agency) and the Food, Drug and Consumer Products Act of 1971, give credence to this philosophy and continue the trend against all kinds of toxic substances in paints.

Ramifications of heavy metal toxicity legislation, and further controls and restrictions of air and water pollution by hazardous chemicals are already being felt throughout our industry. Timetables have been set before us by all levels of government. In California, a law stringently limits the amount of solvent emission to a specific number of pounds per 24-hour period. That need for finding new kinds of pigment substitutes and paint systems has become our immediate concern.

One of the initial steps taken by the automotive industry to cut back solvent emissions was the conversion to NAD (Non-Aqueous Dispersion) systems which raise the amount of solids in the paint while proportionately reducing the amount of solvent content. This, however, appears to be an expedient interim solution. Two other alternatives—water-based systems and powder coatings—solve the solvent emission problem more completely, but require large capital investment for initial installation. Our present Cromophtal® and Irgazin® pigment lines work well in water systems and our development efforts are geared to new products and product forms which disperse easily in acqueous vehicles. Our Microlith® powdered pigment preparations are currently enjoying a new application area in powder coatings of the acrylic and epoxy resin types. Of course, our company is not alone in the development of products for these newer systems.

These systems may give new lifeblood to the automotive and other industries on several fronts. Few people outside the industry think much about the economic burden of recent legislation. For example, an automotive assembly plant on a three-shift operation may be limited, or even worse have to cut back, on the number of cars it may produce, if the emissions from its paint application lines exceed the legal limit.

In other situations, such as those governed by noise control and toxicity regulations, health hazards and economic problems often overlap. Not only does the possibility of inplant worker contamination exist from handling toxic materials, but noise control standards limit the decibles per man-hour for ball milling. Thus, industry is called upon to find suitable non-toxic replacements for heavy metal pigments and, at the same time, to develop pigments that will disperse faster (let's say in four hours rather than at the normal 12 to 16-hour rate) to comply with OSHA regulations. If these substitutes are not developed and utilized, the labor cost will increase substantially over what it is today.

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This "easily dispersed" pigment requirement area is one that CIBA-GEIGY has been researching for some time. We now have two Hansa yellows that will stir in on a Cowles dissolver and a Beta CPC blue that will ball mill in four hours or sand mill in one pass. This industry interest in easily dispersed organic colorants, I believe, will become a trend which will foster the development by technology-based pigment houses of whole new lines of full strength E.D. organic pigments in powder or pellet form.

Never before in history has our industry been faced with so great a technological challenge. Leaving aside the problem of driers and preservatives, certainly the most imperative demand is for effective replacement of lead-containing pigments such as chrome yellow and molybdate orange with pigments of more secure toxicological behavior.

Although some inorganic pigments, such as cadmium sulfate yellows, nickel titanate yellows, cadmium sulfoselenide reds, and mercury cadmium reds, offer some valid alternatives, from the coloristic point of view, the presence of heavy metals in them makes their selection dubious in light of present and future legislative trends.

Iron oxide and earth pigments offer a good and economical solution whenever the proposed shades to be matched do not involve any substantial color brightness. Whenever brightness of shade similar to or better than the original chrome yellows and molybdate oranges is required, the iron oxide pigments become unsuitable and the only valid alternative left is among the organic pigments. This, I believe, is where the future of our new technology lies.

Although organic pigments vary in their toxicological behavior, they can be considered safer than heavy metal-based pigments, if ingested. Virtually non-toxic, the organic pigment portion on the dry film is generally in the range of one to 15 per cent—reducing proportionately the already minute heavy metal contribution from the pigments to the paint film.

The following suggestions are the result of a series of comparative studies of different architectural and industrial finishes, involving a selection of organic pigments which we feel offer requisite durability and general performance equal to and, in many cases superior to, existing chrome yellows and molybdate oranges.

(1.) For Interior Durability:

Trade Sales—Arylamide Yellows (Irgalite Yellows PDS-1, PDS-2)
Dinitroaniline Orange

Industrial Finishes—Diarylide MX Yellow (Irgalite Yellow LBAW)
Benzidine Orange

(2.) Medium Exterior Durability:

Trade Sales—Blends of Arylamide Yellows with Isoindolinone Yellows (Irgazine Yellows 2GLT/2RLT) and/or with yellow oxides.
Blends of Dis-AZO Orange (Cromophtal Orange 4R) with oxides.

Industrial Finishes—Blends of Isoindolinone Yellows with oxides.
Blends of Dis-AZO Orange (Orange 4R) with oxide.

(3.) Upper Medium Exterior Durability

Trade Sales and Industrial Finishes —Blends of Isoindolinone Yellows (Irgazine Yellows 2GLT/2RLT) with special Arylamide Yellow (Yellow 97).

*Note special Arylamide Yellow performance varies depending upon the system. (Not recommended for baking systems.)

(4.) High Fastness Exterior Durability:

Trade Sales and Industrial Finishes—

1. Bright shades—Isoindolinone Yellows (Irgazin Yellows 2GLT/2RLT/3RLT)
2. Dull Shades—Isoindolinone Yellows blended with yellow and/or red oxides.

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