

# INDUSTRIAL COATINGS NEWS

Vol. 2B Issue 5

Summer 94

4607 Linden Place Pearland, TX 77584 C.E. Wong-Editor \$6.00/issue

## EPOXY COATINGS REVISITED - A NEW GENERATION

If it has been a while since you've looked at epoxy paint technology and what it can do for you, it's time you re-educated yourself. That's the advise of Paul Oman whose Texas-based company is the distributor of a line of solvent-free epoxy coatings. Mr. Oman, along with all epoxy paint manufacturers, universally feel they have a new story worth telling. For openers, it's no longer called paint, these are coatings and using the "P" word is a sure sign of novice status.

What's So Great About Epoxy? - Why even use epoxy coatings? Well, for one thing they seal as much as they coat. There really isn't much difference between epoxy coatings, epoxy putties and epoxy adhesives except for viscosity. They are also very acid resistant, tough and very durable. When your "paint" has to do more than just provide a pretty surface, epoxy coatings are often the product of choice. But choosing an epoxy isn't as simple as it once was. There are many types, grades and qualities of epoxy coatings. Knowing enough about them to select the best for your application could save you problems and expenses down the road.

Epoxy Formulations - Environmental regulation is perhaps the primary driving factor behind new epoxy coating technology, but before we get into that and the entire solvent-free, 0% VOC issue, let's define the different types of epoxy/curing agent formulations. There is not just one type of epoxy coatings but many. Excluding the

solvents, the "nasty" part of epoxies come from the curing agent half of these two-part products. Be wary of epoxy manufacturers that attempt to hide the composition of their curing agents. They might well be hiding something you should know about.

Closely, although not completely tied to the curing agent composition issue, is the types of epoxy coatings available on the market. The ones you're most likely to run up against are urethane epoxies, phenolic epoxies, coal tar epoxies and several flavors of polyamine epoxies.

The Urethanes provide a good finish but tend to be porous, absorbing the chemicals etc. that are frequently used around surfaces coated with epoxies. Because they are so porous, recommended application thicknesses tend to be very great. Because coverage per gallon is so small, these coatings are relatively expensive. When a less thick coating is required, glass flakes are commonly added to the epoxy in an attempt to mechanically reduce the coating's porosity. A glass flake epoxy thickness could still be 20 mils.

Phenolic epoxies are very common and many, if not most, low-end, low-cost (\$30-\$50/gal.) epoxy coatings are of this type. Phenolic epoxies are brittle, however, and are subject to cracking or chipping.

Polyamine epoxies are less brittle than the phenolics and are considered superior. Aliphatic polyamines take all the good features of the polyamines and typically include outstanding spreadability, color retention etc. Consider these

as the high end formulation.

Unfortunately, all epoxy coatings, including the aliphatic polyamines, don't like the sun's ultraviolet radiation (UV). They quickly lose their glossy surface and the lesser quality products become chalky over time. That's why in many cases epoxy coatings are overcoated with a high gloss, cosmetic covering of polyurethane. A second reason for overcoating is that many epoxy coatings do not come in a wide range of colors.

Solvent-Free - With the formulation considerations behind us, the big issue is solvent-free vs. traditional solvent-based epoxies. Most epoxy coatings contain 20%-40% strong solvents (i.e. they are 60%-80% solids). These solvents are nasty, unhealthy, odorous chemicals that can affect your health and cause serious environmental damage. A gallon of 30% solvent-based epoxy might weigh 10 pounds, meaning that 3 pounds of dangerous solvents will be released into the air with every gallon used. The EPA doesn't like that, in fact on March 1, 1994, they announced a final ruling to reduce toxic air emissions by almost 90% from the chemical industry. Yesterday, using solvent-free coatings in industrial settings was the politically correct thing to do. Today it's rapidly becoming the legal thing to do. Bear in mind that while solvent-free removes one of the health risk concerns, that still leaves possible risks associated with the composition of the curing agent.

Finally, as any consumer would suspect, solvent-free also

means more expensive, typically \$60-\$100/gallon. However, there is also a volume advantage. With solvent-free coatings, you really are buying a gallon of coating, not three quarts of coating and one quart of disappearing solvents.

Solvent-Free Benefits - Besides the health, public relations, legal, environmental and volume advantages of solvent-free coatings, there are additional pluses. No solvents means no fumes. Because they are odorless these coatings can be used in confined work-spaces without breathing aids and can also be used in group settings without odor disrupting results. Solventless also often equates to non-hazardous as far as shipping and storage is concerned. And unmixed (i.e. the epoxy and the curing agent are not combined) product can sit in poorly sealed, half-filled containers with no worry of hardening. Many, but not all, solvent-free epoxy coatings can be applied to wet or damp surfaces. Some can even be applied underwater. This can be useful around water storage tanks, cooling towers, swimming pools and for outside coating products in perpetually rainy or humid areas.

Because solvents, especially the stronger ones common in traditional epoxy coatings, dissolve, bubble, blister or weaken many materials, most strong solvent-based products are only applied to very clean, raw surfaces. Solvent-free coatings change all of this. Sure, you should have as clean a surface as possible, but without solvents to soften what is about to get covered, surface preparation is less critical. Even styrofoam and sponge rubber can be coated without damage using solvent-free epoxy products. This non-reactivity with existing undercoats means a better bond and therefore a longer life.

A final, but often overlooked

benefit for corrosion protection applications is that thick areas of solvent-free epoxy coatings (i.e. in corners and along floor/wall seams) are not subject to shrinkage cracking. This can occur when trapped solvents in surface-dry situations push their way out into the atmosphere.

Curing Time - A primary consideration in the decision to use epoxy coatings is the product cure time. Spray applications, i.e. in manufacturing, require a quick cure that compares favorably with the drying times of non-epoxy alternatives. However, quick cure times require special spray guns that mix the epoxy base and curing agent at the nozzle. For use in conventional spray guns, a slow cure is necessary so that the gun can be cleaned with a solvent from time to time before the epoxy begins to harden and cure inside the gun and nozzle. Mr. Oman's company sells epoxies with cure times of between 5 minutes (for quick patching/sealing jobs) to about 2 hours, although he can custom order solvent-free epoxies with a cure time beginning at 45 seconds and extending out to into hours or days. Two gallons of epoxy floor covering can be spread out in about 20 minutes. Hand brushing it on to a piece of equipment takes much longer and requires a much slower curing time.

#### Premium Grade Epoxy Coatings -

Premium grade epoxy products combine the best of features with the highest price, often around \$100 or more per gallon. But as you may have gleaned by now, you generally get what you pay for. Premium epoxies will be solvent-free, most likely based upon an aliphatic polyamine formulation with "safe" curing agent ingredients. It may also

have metal passivators or zinc type additives, thus making it very nearly a self-priming, metal coating. Availability of custom colors, instead of just gray, is another indicator of high quality epoxies and may, in some cases, negate the need for a "color" overcoat. High-end products also will have easy 1-1 or 2-1 mixing ratios for the epoxy and curing agent. Most likely these high-end products can be applied underwater, or at least to damp surfaces and in high humidity settings. In most cases, it's only the modern high-tech, premium epoxies that can be spray-gun applied rather than simply brushed or rolled. Spraying, either with conventional sprayers, or special two-part spraying systems, requires a product formulation that goes beyond a generic, low-end epoxy/curing agent mixture.

Make no mistake, these coatings are expensive, but they may well be less costly in the long run. For most projects, the big expense is labor, not materials. Labor costs, and other surface repair pre-coating material costs can be 2-3 times the cost of the coatings. Just a small savings in the labor portion of the cost equation thanks to a more durable, better bonding, color matching epoxy coating can quickly recoup the higher cost of premium grade epoxy.

Conclusions - As the technical side of epoxy coatings and the requirements for solvent-free products both grow, expect to see more solvent-free epoxy coating specialists. PROTEC's Mr. Oman reports that he is aware of only one manufacturer that currently produces nothing but solvent-free epoxy coatings. Mr Oman can be reached at

###