

## COATINGS AND EPOXY NEWS FROM:

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PAUL OMAN ----- Progressive Epoxy Polymers, Inc.  
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## Moisture Independent Vs. Moisture Dependent Coatings

By Paul Oman  
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## PART A - MOISTURE INDEPENDENT EPOXIES

Moisture plays such a critical roll in the success or failure of high performance maintenance coatings that it seems odd that some coatings need moisture to cure, while others do not. Despite these completely opposite characteristics, there is a place for both kinds of coatings in the workplace.

In our previous newsletter (see link below) we discussed the development of underwater epoxy coatings, primarily the thick, paste like repair epoxies, such as Wet / Dry 700™ and original Splash Zone® as being the most recognized and representative of the group. But high performance maintenance epoxies are a slightly different niche. Paste and putties work well underwater where a thick product film thickness usually expedites the project, cost being a secondary issue. But coating, say 2000 square feet of a outdoor secondary containment area, or a steel lined run-off channel, is another matter. Cost and ease of application, say by roller using in-house maintenance personnel, become much more important. In these types of applications "underwater" more commonly addresses, high humidity (such as along the Gulf Coast), regular rain showers (i.e. much of Florida), morning dew, condensation, or simply puddles of standing water from rain or entrapment in secondary containment areas. Unlike their purely underwater brothers, these onshore moisture indifferent coatings often have to also provide enhanced abrasion resistance, chemical resistance, UV resistance, and cold weather application.

That's asking a lot from a coating, besides the more and more frequent requirement that it also needs to be non-hazmat to ship, and solvent free (0% VOC). just a few years ago, finding such an "All Performance" epoxy coating would have been very difficult. Even now, it perhaps pushes the limits a bit too far.

Several years ago Progressive Epoxy Polymers, Inc. addressed the problem by introducing their Corro Coat FC 2100 epoxy. Since then they've grown that single product into a unique family of FC 2100 epoxies designed to address many of the added needs of an "Onshore Underwater" maintenance epoxy.

The original FC (stands for Fiber and Ceramic) 2100, and still the firm's primary maintenance epoxy, consists of a 100% solids epoxy base fortified with DuPont's Kevlar® microfibers and feldspar mineral ceramic. The Kevlar® works like rebar in concrete or 'rip-stop' nylon. The feldspar ceramic provides

tremendous abrasion resistance and lots of internal 'body' to the resin. Despite these additives, FC 2100 rolls on leaving a smooth, hard finish. Coupled with this, is a field friendly 2:1 mix ratio, and a non-hazmat, cycloaliphatic curing system. Cycloaliphatics are used almost exclusively in epoxy electrical insulators due to their enhanced resistance to weathering compared to other epoxy curing agents (search the web for Epoxy, Electrical, Insulators). Because of its resin "body" and proprietary curing system, FC 2100 applies underwater easily.

To better address the needs for an ideal maintenance epoxy, a Novolac® version of the part A resin side was introduced. The Kevlar® and feldspar ceramic remain, viscosity is the same too. The regular part A resin, or the Novolac® part A resin, are completely interchangeable with the non-hazmat curing system.

But the picture gets even brighter with the introduction of several also interchangeable curing agents. Any of the curing agents can be used with either of the regular or novolac® part A resins. Besides the original non-hazmat, underwater curing agents, the new curing agents currently include one with additional flex, one for high temperature service, and one for cold weather (or cold water!) application. The new more flexible curing agent provides a bit more give (and thus impact resistance) than the firmer (and slightly more abrasion resistant) original FC 2100, without reducing the Kevlar® or feldspar ceramic content (which tend to make the product very hard) of the part A resin. The Flex version is a 1:1 mix and still maintains its non-hazmat shipping status. The high temperature curing agent (at 4:1 mix ratio) raises the service temperature to about 300 or 350 degrees F, but requires hazmat regulated shipping. So to does the 'FAST' version of FC 2100 (with a 2:1 mix ratio). A reduced fire/smoke version of FC 2100 has been under development for some time.

#### LINKS:

Underwater epoxies ([www.epoxyproducts.com/uwhistory.html](http://www.epoxyproducts.com/uwhistory.html))

FC 2100 ([www.epoxyproducts.com/fc2100.html](http://www.epoxyproducts.com/fc2100.html))

Cycloaliphatics ([www.epoxyproducts.com/cyclo.html](http://www.epoxyproducts.com/cyclo.html))

Data/MSDS ([www.epoxyproducts.com/datamsds.html](http://www.epoxyproducts.com/datamsds.html))

Kevlar® ([www.epoxyproducts.com/kevlar4u.html](http://www.epoxyproducts.com/kevlar4u.html))

#### PART B - MOISTURE DEPENDENT COATINGS

Despite being an "Epoxy Person," I have to admit that I'm very impressed with moisture cured urethanes (commonly referred to as MCU), specifically one with aluminum fill/pigment called Aluthane™. A similar version with zinc powder and functioning as an organic zinc primer, is also available.

MCUs are single component products, highly solvent based, that take moisture from the air to cure and harden. I assume that as the moisture is incorporated into the coating it swells on a molecular scale filling in tiny gaps etc. and forming an extremely 'solid' and impermeable surface. The aluminum flake pigment in the Aluthane compliments the process by stacking as tiny plates one on top of the other forming an additional barrier to permeability and porosity. We confirmed this by testing water absorption of immersed wooden blocks. Some blocks were coated with epoxy, others with aluthane. The aluthane blocks had less water weight gain then the epoxy encapsulated blocks.

Another characteristic of MCUs is their tenacious bond. Perhaps it is due to the high solvent content, or suggested molecular swelling, or the anchoring affect of the aluminum pigment in the case of Aluthane. In any case, contractors often use MCUs as a primer on surfaces that they cannot do proper surface preparation upon. In my own personal tests, I tried the Aluthane on wooden outside steps exposed through a bitter New Hampshire winter. The results were so encouraging that the following spring I painted the front porch with it. The porch was originally coated with peeling deck enamel. I simply water-blasted the porch to remove more loose enamel and then 'slapped' on the MCU. After nearly one year, still perfect with no peeling at all of the silvery, galvanized gray, looking aluthane.

When selling aluthane, I offer several warnings. Get it on your hands, and it doesn't come off, even with general purpose solvent clearers. You have to let it wear off over a few days. Also, get any in the rim of the can and you'll never get that lid off again (just more confirmation of its tenacious bonding). After a

can is opened the thin aluthane will begin to skin over, thicken and lump up as it begins to cure inside the partially filled can. After opening shelf life is, at best, one week.

What about serviceability? Aluthane is service temperature rated to about 300 degrees F. It makes an ideal primer under other coatings, or metallic silvery gray topcoat over epoxies etc. (it has been used on metal bridges and both its performance and its appearance).

Urethanes are by nature never recommended for immersion service, but I thought perhaps this product might be an exception (despite the chemists' warnings). I coated a hard commercial Armstrong 12 X 12 floor tile and a similar sized piece of plywood with aluthane and submerged them both for five months in a New Hampshire pond. Upon subsequent examination there was no blistering, peeling or any sort of damage to the coating on either of the two test panels. Darn impressive!

#### LINKS

Aluthane ([www.epoxyproducts.com/aluthane.html](http://www.epoxyproducts.com/aluthane.html))

Primers ([www.epoxyproducts.com/primer.html](http://www.epoxyproducts.com/primer.html))

Wood sealing tests ([www.epoxyproducts.com/woodseal.html](http://www.epoxyproducts.com/woodseal.html))

Data/MSDS ([www.epoxyproducts.com/datamsds.html](http://www.epoxyproducts.com/datamsds.html))

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NOTE; ONLY THE NONHAZMAT VERSIONS OF ANY OF THE PRODUCTS MENTIONED ABOVE ARE SHIPPED OUTSIDE THE USA

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0401 Underwater Epoxies 101 TechNotes

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