ARCOR® ® High-Performance Novolac Epoxy Coatings & Rebuilding Materials

Technical Review - Product Cure

There are two critical components of successful long term coating performance; the ability of the coating to resist the permeation of the solution, and the adhesion of the coating to the substrate.

Many issues can inhibit proper in-situ cure, most notably humidity and rate of cure. High humidity can prompt reaction of the product amines and epoxide groups with hydroxyl groups and hydrogen present in water vapor. This will reduce potential for full cure. This is one of the reasons dehumidification is highly recommended in critical applications.

ARCOR® utilizes multiple amine structures in its curing agents to facilitate a 'timed release' cure that maximizes the full cure potential and minimizes the occurrence of amine blush particularly in the high functionality resins and the high temperature resistant products.

Rate of cure is also very important in allowing epoxide and hydrogen reactive sites to 'meet' in order to react. If the product cures too quickly reacted molecules can inhibit unreactive molecules from reaching each other. This reduces the theoretical cure. Therefore it is best to allow the product to react as slowly as practical. Generally you would allow the product to react at room temperature (72-75F) until hard, 4-8 hours**.** The 3.6 products reach about 85-90% of cure at 72F (based on measurement of residual exotherm).

Then apply heat allowing the heat to increase slowly to 135F and allow to remain for 4 hours. At a post cure of 135F it gets to 90-95% cure.

Then increase heat slowly again to 250F and allow to remain 2 hours to reach a theoretical 100% cure.

In order not to stress the coating, cool down in the same stepped fashion.

Post cure provides a significant improvement in glass transition temp. Glass transition is a phenomenon of epoxies which can be used to measure completeness of cure and also is indicative of the softening point of the cured epoxy, the point at which failure can begin at elevated temperatures.

From 72F to 250F post cure of an ARCOR® 3.6 Novolac sees the Tg increase from 135F to 238F. So for a higher temp application post cure is crucial to ultimate in-service temperature performance. Acids are also environments that will see big improvement in performance with post cure. This is true with any Novolac.

In the ARCOR® HT (high temp) a modified amine blend is used with traditional products like EE-11, EE-20, and EE-121 to get higher temperature performance up to 100F in immersion. These products require a minimum 3-step post cure; 135F @ 2hrs., 175F @ 2hrs., 200F @ 2 hrs., 250F @ 2 hrs., followed by a stepped cool down. Post cure will improve the final Tg to 340F for the 121HT.

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If heating to 250F is not feasible excellent results can still be obtained by applying the heat slowly to the temperature that can be reasonably achieved.

ARCOR® has found that, in certain applications, post cure will occur in service as the units warm up & we have found the same performance as we did with post cured test plates. This is not recommended in strong acid immersions.

The second major aspect of performance is adhesion. To maximize you want to get as clean a surface as possible. A 'white metal' abrasive blast will give the best possible results. It is also very important to use an angular abrasive to cut and profile the substrate to get a 3 mil or better angular profile (1 mil = .001 inch = 25 microns). Cleaning is best achieved with finer abrasives (60 - 80 mesh) and the profile is best achieved with medium abrasives (24 - 36 mesh). Often we will blast with a fine grit to clean and the follow with a medium grit to profile. It is also possible to mix the two and blast at one time. We would mix at 25% fine with 75% medium.