

Rapid Cure Coating Systems Lessons Learned

Version
1.1

TRAINING

- The current NAVSEA mandated plural component airless spray pump and application training required for applicators and pump operators for UHS (Ultra High Solids) epoxy materials is applicable to rapid cure systems and beneficial for all production personnel, QA inspectors and RMC inspection personnel.
- Hands-on training including application of the chosen Rapid Cure coating is one of the most important components for a successful Rapid Cure plural component application.
- Tank mock-ups with structural geometry similar to that found in high geometry Navy tanks should be utilized whenever possible for sprayer training. Deteriorated, pitted steel including lumpy welds, weld splatter, undercut welds, hard edges, etc should be employed when possible. Sprayers should extensively check WFT's (Wet Film Thickness readings). QA inspectors in the presence of the sprayers should extensively verify DFT's (Dry Film Thickness readings) using a mini/micro probe equipped gauge (such as an Elcometer 456 Top with the T456FM3R90A-USN (USN = United States Navy) probe. This Elcometer probe is rated up to 60 mils DFT.
- During hands-on training sprayers should experiment with different tip sizes including a 417, 419 and a 421. For specifically spraying "stripe" coat areas, sprayers should try tips with a narrower fan width including a 219, 221, 319, or 321. Note: The first number in a tip designation denotes the fan width. The first number is doubled and approximates the fan width (in inches) at 12" from the tip. The 2nd and 3rd digits designate the orifice size in thousands of an inch. A 419 tip has a 19 thou orifice and will produce a fan width of 8" at a distance of 12" from the tip. Only in wide open tanks should tips such as a 519, a 521 or a 523 be considered.
<http://www.o-geepaint.com/Sprayers/Tips.shtml>
- The single most important factor in successful, trouble free operation of a plural component pump is cleanliness. 90% of pump problems and off ratio warnings can be traced to cleanliness issues. This subject should be extensively covered during training. Trainees should be taught to strain using aluminum porch screen all material being added to bulk hoppers on the spray pump. Trainees should be instructed to never add cold bulk materials to the pump hoppers.

EQUIPMENT

- The plural component spray pumps currently used by shipyards for UHS epoxies are suitable for application of rapid cure system.
- Hot Potting (pre-mixing the two components) and application with standard airless spray equipment is not an option with rapid cure systems.
- Pump mounted inline component heaters must always be employed. The NAVSEA approved Rapid Cure Systems all require heating of one or both components. Line heating systems (for lines between the pump and the mixing block) should be available but some applicators have not needed them when lines were very short and/or ambient temperatures were moderate to hot. Proximity of the pump to the work will dictate many factors.
- Most plural component pumps are set up to be able to recirculate the components to the mixing block and back to the pump to aid in maintaining temperature of the components. In warm to moderate temperatures or depending on the distance between pump and spray gun many applicators choose to not use this function and do not recirculate.
- Cold weather applications should always employ insulated lines and line heaters to maintain temperature between the pump and the mixing block with attached inline static mixing tube.

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- The high pressure airless spray line from the mixing block to the spray gun should be kept as short as possible, normally 50' in length and normally ¼" diameter. If greater length is required, only the last section of spray line should be ¼", all other lines should be 3/8" or ½". This line is not normally insulated or heated. Many sprayers prefer adding a smaller "whip hose" to this line just before the gun, 3/16" diameter, 3' – 6' long. The pressure loss due to this small diameter whip can be problematic; normally the spray gun is attached directly to the end of the 50' ¼" line from the mixing block. For 75' overall length, a 50' section of 3/8" and a 25' section of ¼" has worked successfully.
- If possible, try not to allow spray lines to lie on cold steel decks if un-insulated and unheated (for cold weather applications). During applications in high temperature conditions, consider the effect of direct sunlight and high ambient temperatures on material, pump and spray line.
- Never add cold bulk material to the material hoppers on the plural component pump. Components should be pre-warmed. This is also true with Navy standard UHS coatings.
- Both components of the S-W Fast Clad ER system should be power mixed prior to addition to the bulk hoppers. The "B" component of the IPCO INTERLINE 783 system (1 gallon containers) can often be shaken versus power mixed.
- Operating more than one sprayer off of one pump can be problematic. When pump pressure is adjusted high enough to accommodate two sprayers "on the trigger" at the same time, a single sprayer "on the trigger" alone will experience a surge in pressure. The key to spraying complicated geometry is consistent pressure just high enough to achieve adequate atomization and a clean fan pattern (no "fingers"). Surging pressure makes the task far more difficult. If it is anticipated that more than one sprayer will be operating off of a pump, all lines on the pump should be increased from the standard 3/8" diameter to ½" diameter.
- Most pump operators and tech reps believe the mixing block and static mixing wand should not be mounted on the pump. There should be a minimum of 50' of 3/8" or ½" spray line between the pump and the mixing block.
- Many pump operators and tech reps prefer that the static mixing wand not be attached directly to the mixing block. They prefer mixing block, 50' of 3/8" or 1/2 "spray line, static mixing tube, 25' of ¼" spray line to gun. Both configurations have worked successfully.
- The airless spray guns used most often by East Coast applicators is a G-10 type of spray gun (about \$100) or a WIWA spray gun (about \$300). Many West coast applicators prefer a Graco Contractor gun.
- Due to the rapid cure nature of these products, overspray falling back onto the gun will often build up in areas on the gun that slide open and shut eventually preventing the gun from shutting off completely (the needle does not fully seat). Normally a piece of duct tape partially folded back, glue to glue and attached to the fixed part of the gun serving to shroud the gap solves this problem.
- Airless spray tips normally used are designed to be installed by hand tightening without the necessity of using wrenches. The first time a wrench is used to tighten a tip on the gun results in that tip housing always requiring a wrench to properly seal. Tip assemblies should always be hand tightened only.
- Due to the rapid cure nature of these products, a build up of reacted material on the tip guard at the tip orifice often occurs forming a "donut" of material that over time grows large enough to interfere with the fan pattern. Reacted material build up on the tip and tip guard eventually make hand disassembly of the tip from the tip holder/tip guard impossible. To combat this, most

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applicators keep a pail of solvent and a tooth brush style brass or stainless steel wire brush available. Approximately every 20 minutes or so, the sprayer removes the tip housing with tip and replaces it with a clean assembly. The coated assembly is soaked in the solvent and cleaned (if necessary) by the line handler and becomes available for swap out.

SPRAY APPLICATION

- Stripe coats (sprayed or brushed) should never be applied prior to full coats atop SP-10 abrasive blast preparation in tanks. The contamination of surfaces by personnel and spray lines, explosion proof light power cords, breathing airlines, debris out of staging and wrap-up materials, etc is unavoidable. Overspray is deposited on all surfaces not receiving the spray stripe coat making surfaces “sticky” and begging to attract debris. When the applicator enters a tank to apply the first coat atop the SP-10 preparation it must be a full coat. A dry, fully coated surface is easy to decontaminate. Over sprayed, sticky SP-10 profiled steel is almost impossible to properly decontaminate.
- If single coat application of the full system is accomplished, cleanliness in the tank is paramount. In multi-coat applications, upward facing surfaces (“flats”) are always lightly scraped and cleaned between coats and any debris under/in/atop the coating is removed and repaired by the following coat. With single coat applications scraping is accomplished to remove debris from upward facing surfaces but often small particles that may go to substrate are scraped out and may be difficult to detect visually. Holiday detection (low voltage sponge good up to 20 mils DFT when surfactant is added to the water used to moisten the sponge) or high voltage holiday detection (dangerous and destructive) could be used but might negate any time savings achieved through single coat application. Purple light inspection may reveal holidays down to substrate but even 2 – 3 mils of coating does not stand out under purple light inspection but will fail prematurely.
- The NAVSEA approved rapid cure systems are slightly more difficult to deal with when compared to plural component applications of Navy standard UHS epoxy coating systems. The short pot life (normally 7 minutes) is the biggest factor. The spray gun must be triggered within 5 minutes or the mixing block, static mixing wand, spray line and gun must be solvent flushed. Applicators should always have access to a pail to trigger the gun into for these times and to also use when flushing the line within the tank. It is often impractical to remove the gun from the tank for flushing (especially true in inner bottom tank configuration).
- Although the flash point of the Rapid Cure systems (and most UHS coatings) in general is considerably higher than standard epoxy coatings, all precautions invoked for flammable materials in interior applications should be observed since the solvents used for flushing and cleaning the pump and lines are flammable and there is always the possibility that some solvent makes its way into the coating in the spray system.
- The rapid cure systems can be applied up to 30 mils (and higher) WFT/DFT in a single spray application without runs sags or curtains.
- The difficulty encountered achieving a uniform 20 mils minimum WFT/DFT minimum in a single coat with this system is a human problem and a structural complexity problem and not related to properties of the coating.
- For S-W Fast Clad ER the “A” component should be heated to 100F minimum and the “B” heated to 90F minimum. Never heat the components above 130F. Temperature extremes high or low may dictate adjustment of these recommended temperatures but never exceed 130F for either component, deterioration will occur.
- Sherwin-Williams Fast Clad ER mixes at a 1 to 1 Ratio by volume. Full 5 gallon containers of each component are the norm. The other approved Rapid Cure system, IPCO 783, mixes at a 3

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to 1 ratio. A standard Kit is 3 gallons of base in a 5 gallon can and one gallon of part B in a one gallon can.

- S-W Fast Clad ER has a 14 day maximum recoat window at all temperatures. At low temperatures, the manufacturer may accept a longer recoat window (up to 28 days). The other approved Rapid Cure system, IPCO Interline 783 has a 7 day maximum recoat window at all temperatures (shorter if surfaces are subject to UV light (sunlight) although this is not normally a consideration in tanks.
- There is a belief that tank sprayers should be able to accomplish WFT readings throughout the application. The reality is that under most circumstances a short time after beginning a spray application in Navy tanks the painter is coated with sticky material and unable to handle a WFT gauge. Sprayers use their WFT gauge at the beginning of the application and set their pattern and gun speed/distance from the surface at the beginning of the application before they are stuck-up from head to toe.
- The spray painter should always have a bucket close at hand in the tank. The gun MUST be triggered within 5 minutes to avoid material setting up in mixing block, static mixing wand, spray line or gun. Solvent flushing through the mixing block to the gun should be accomplished if more time is needed or operations must cease.
- Spray back sides of I-beams / structures first within the section being coated. Only after proper WFT has been applied on these surfaces should the "flats" be sprayed.
- It may be beneficial to cover the deck with drop cloth prior to spraying upper portion of tank (prevents excessive DFT's on deck).
- Extra sprayer/helpers (switch out to reduce fatigue). Often a second sprayer will serve as the line handler and the two sprayers will swap out duties to keep the spray application a continuous operation.

TOUCH-UP APPLICATION

- Cartridges are ideal for touch-up application and their use should always be encouraged. New material should not be added to older material due to shortened pot life caused when the new material is added to the older material. There is nothing wrong with dispensing material directly from the static mixing tube on the cartridge to the area to be coated and then spreading the material with a brush.
- Cartridges should always be shaken prior to use. Mechanical cartridge shakers are available from the manufacturer. Hand shaking appears successful but is time consuming.
- These systems provide approximately 7 minutes of pot life during touch-up applications when higher temperatures are encountered. Some applicators have learned to deal with this by mixing T/U coating in the tank or just outside the access. Small quantities are mixed and new pail liners are always used (never add new material to older material). The 1 to 1 mix ratio for Fast Clad ER makes mixing of small batches fairly easy. The other approved Rapid Cure system, IPCO 783, mixes at a 3 to 1 ratio.
- On horizontal surfaces 20 mils WFT can easily be applied in one touch-up coat. On vertical surfaces two coats at 10 – 12 mils WFT per coat are normally accomplished.