Advantages of Solvent-free High Performance Coatings for Utility Corrosion Problems

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Water distribution and sewer infrastructure expenditures will exceed $500 billion over the next two decades according to the American Water Works Association and the Environmental Protection Agency. Recent coating industry advances have increased application diversity, safety and high performance capabilities. These advanced coatings will play much more vital roles in protecting this infrastructure. Specifiers, contractors, owners and operators of water, sewer and gas utilities need to be informed of proven coating technology improvements to ensure optimum infrastructure life cycles.

Coating Industry Developments: Performance, Environmental and Safety Driven Trend from Solvent-Borne to Solvent-Free Coating

Municipal infrastructure has generally been built of concrete, brick, steel or fiberglass. Invariably, all infrastructure suffers from the pervasive effects of age, corrosion and erosion, even in relatively benign environments ... while those located in more aggressive environments deteriorate more rapidly ... some in less than a year. Properly specified, advanced solvent-free coatings are more capable of inhibiting this process than traditional solvent borne coatings in most structures.

Historically, solvent-borne maintenance coatings have been used to provide short-term protection for many utility structures. New moisture tolerant, high performance solvent-free coatings offer safe, longer lasting and proven solutions suitable for increasingly diverse applications in utility industries.

Maintenance coatings are repetitively used to prolong the life of infrastructure. These solvent-borne products are typically applied too thin and therefore do not consistently provide effective long-term protection in corrosive environments. Such systems cure via an evaporative process requiring multiple thin coats with enough time in between for the solvent to evaporate between coats. The evaporative process can leave pinholes in the coating, which leads to premature failure, especially in corrosive environments.

Weather conditions also play an important role in determining the time necessary for the evaporation process to complete before another coat is applied. This ironically complicates the field variables that must be monitored for a successful application and typically limits the number of coats that can be applied in an economically justified time frame. Also, as complexity increases, so does risk and, ultimately, the probability of premature failure. Until recently, most coatings contained high percentages (>50%) of solvents which when released during the drying/curing process emit volatile organic compounds (VOCs). Reactive resins, pigments and fillers comprise the balance (or "solids" content). With the passage of The Clean Air Act over 30 years ago and many amendments thereto, solvents have become stringently regulated and reduced to help prevent depletion of ozone in the earth's atmosphere. Solvents now typically comprise less than 40% of most of the current

formulations. However, solvent-borne coatings still produce compounds that are unsafe to breathe and flammable in confined spaces. Shrinkage is another disadvantage of solvent borne coatings. Their "dry film thickness" will generally be thinner proportionate to the amount of solvent in the formula ... i.e. 67% solids and 33% solvent content means the dry film thickness will be approximately 33% thinner than the wet film thickness application. Many solvent borne coal tar based coatings also contain recognized carcinogens such as coal tar pitch and asbestos, which raises additional liability issues as well.

Solvent-free, 100% solids epoxy and urethane coatings offer the utility industry many advantages in performance and safety. These solvent-free coatings cure via a thermoset reaction with a catalyst that eliminates the evaporative process. They can cure in a vacuum ... some epoxies even underwater. Epoxies can also be formulated with excellent moisture tolerance to facilitate a good bond to damp substrates ... ideal for underground applications. Once mixed, these formulations are highly reactive and can be quickly and thickly applied to rehabilitate rough corroded surfaces ... another advantage in rehabilitation projects, which require more material to provide a monolithic lining. Most structures can be returned to service in less than 24 hours. Some hybrid epoxy and rigid urethane formulations actually provide structural enhancement to severely corroded steel, masonry and concrete structures.

Wastewater, Potable Water and Gas Utility Uses:

Treatment Plants: Tanks, Clarifiers, Secondary Containment, Biofilters, Clear Wells, Sedimentation Basins, etc.
Collection Systems: Manholes, Pipelines, Tunnels, Wet Wells, Lift Stations, Pump Stations, etc.
Distribution Systems: Force Mains, Pipelines, etc.

Professional Application Critical

Solvent-free high performance coatings require proper equipment and trained personnel for spray applications... ideally performed by manufacturer certified and experienced applicators. This better ensures the applicator's familiarity with the products, the project environment and the often overlooked but critical relationship between proper surface preparation and a successful coating project. Products are typically applied by plural component spray application which permits very remote applications (200 meters from pump). The resulting high performance solvent-free coating applications cost moderately more than traditional solvent-borne applications. However, solvent-free solutions can provide protection far longer and at less net present values than traditional maintenance coatings.

If you have any questions, please contact **Dr. C.Vipulanandan**