THE IMPORTANCE OF COATINGS TO ACHIEVE HIGH PERFORMANCE IN CHEMICAL STORAGE

The risk of corrosive attacks by highly volatile products, such as those contained in bulk liquid storage facilities, is a key concern for all operators.

The need for a fully reliable and polymer coating to maintain the integrity of the products stored as well as preserve the tank asset is of great importance in any storage operation.

CHEMISTRY IS KEY

An effective anti-corrosion coating has the ability to negate adsorption and absorption of a chemical being contained in the tank. Adsorption is a surface condition, in which the chemical can be removed easily by cleaning. Absorption on the other hand, is the penetration of chemical molecules into the structure of the coating. Absorption is more difficult to remove and requires long drying times and/or chemical cleaning.

Absorption depends on whether the coating molecular structure is open or closed. In polymer chemistry this is referred to as 'cross-link density' of the cured polymer.

Cross-link density can be attributed to 'functionality, an attribute that allows polymers to 'cross-link' together, to form a sort of three-dimensional screen pattern. Different types of polymers have different amounts of functionality; the higher the number the more dense the screen becomes. Typical epoxies have two-functionality, which means when they come together you can achieve four cross-links. The ChemLine polymer by Advanced Polymer Coatings is 'multi-functional,' where there are up to 784 possible cross-links that create a much denser, tighter structure.

The higher the cross-linking of the polymer that can be achieved, the better the performance as a dense, nearly non-permeable coatings barrier prevents the chemical in the tank from reaching the underlying steel substrate where corrosion can occur.

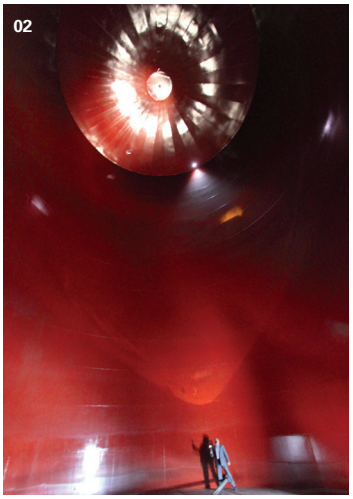
CURING IS A VITAL STEP

Cross-link density depends on the type of epoxy used and the type of curing agent/hardener. Functionality is the number of oxirane/epoxy end caps that can be cross-linked with the curing agent. An initial reaction occurs between the epoxy end caps as they contact the curing agent, creating an exothermic chemical reaction that creates heat. This heat helps molecules rotate around to find unreacted end caps and cross-link.

As the structure polymerises (hardens) over time it becomes more difficult to cross-link the epoxy end caps that become unreachable. In fact, a portion of the epoxy end caps do not cross-link, and this number can be as high as 30% in some cases. Normal phenol epoxies never really obtain a full cure, even over an extended period of time. In the early polymerisation stage at ambient temperatures, polymers cross-link up to 70 to 85%, but over time it becomes almost impossible to force further cross-linking.

Therefore, to achieve the highest cross-link density, the polymer must be fully cured. That is why heat curing during the early stage of polymerisation is important. Research chemists have found that to get the highest percentage of cross-linking in the ChemLine coating (96 to 100%), higher forced air heating keeps epoxy end caps mobile so they can eventually cross-link.

Proper heating curing of the polymer is key to maintaining purity of the chemicals.



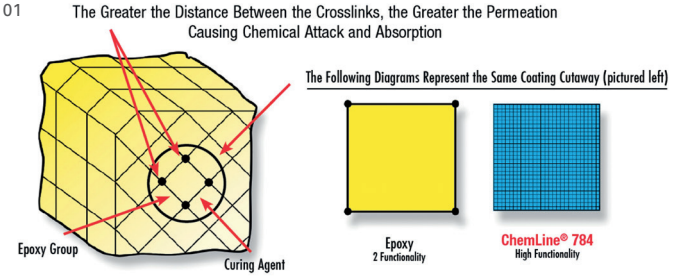
01 Higher cross-linking density is shown in this illustration of a cured coating comparing a normal epoxy to the ChemLine system

02 This new tank at Likit Kimya uses a red-colored ChemLine topcoat for sulphuric acid service

03 This large size grey-colored ChemLine tank at Likit Kimya in Turkey is used to contain MEG

04 New storage tanks are lined with ChemLine at Likit Kimya's facility in Adana, Turkey

01



STORAGE APPLICATIONS

AVES, one of the largest edible oil producers in Turkey, used ChemLine to line four carbon steel

tanks (a total of 1,000 square meters) used for the storage of fatty acid distillates at ambient temperature. These tanks followed a previous order for 14 carbon steel storage tanks at the facility that were also lined with the ChemLine 784/32 coating system.

Several tanks at the Monómeros Colombo Venezolanos' terminal storage facility in Barranquilla, Columbia, required a special lining to handle sulphuric acid. The company requested a lining that could provide high purity storage and also protect against tank corrosion. ChemLine 784/32 was specified to meet these requirements. The carbon steel tanks have a total surface area of 45 square meters, holding a sulphuric acid concentration of 98.5% at an average temperature 40˚C (104 F), and operating at a peak temperature of 80˚C (176 F).

After proper blasting, the coating application work was applied to a film thickness of 16.1 mills and then tested as part of a thorough inspection process. The company reports that the coating has provided excellent chemical resistance since it was installed four years ago.

At the Likit Kimya facility in Adana, Turkey, two new storage tanks were constructed to store mono ethylene glycol (MEG), and another new tank was built to store sulphuric acid.

Each of these carbon steel tanks were built 21 meters high by 14 meters and designed to hold 3,000 m^3 of liquids.

For the three new tanks in Adana, two coats of ChemLine 784/32 were applied to each tank. For the MEG tanks, a red base coat was first applied, followed by the grey topcoat. For the sulphuric acid tank, both the basecoat and topcoat were done in red, as requested, to an average DFT was 350 microns. All tanks are currently in full service, delivering good chemical resistance.

CHEMICAL RESISTANCE AND TESTING

ChemLine provides superior chemical resistance to more than 5,000 thousand aggressive chemicals including H2SO4, waste acids, 37% HCl, acetic acid, and other aggressive acids, caustic soda, alkalis, solvents, hot oils, fracking materials, brine, edible oils, and others.

Coatings by Advanced Polymer Coatings have undergone numerous in-house and outside independent testing, for chemical resistance, absorption, ease of cleanability, and other physical properties. In addition, conventional coating systems such as epoxies, zinc silicates, vinyl esters, rubbers, and phenolics have also been tested to show where there is clear performance differentiation from ChemLine.

FOR MORE INFORMATION

www.adv-polymer.com