

Protecting Storage Tanks from Hazardous Chemicals



By Kevin S. Balaban, Advanced Polymer Coatings

Kevin S. Balaban, global industrial sales manager at APC, handles ChemLine® coating sales and business development for industrial markets that include petroleum and refining, chemical, power, manufacturing, pipelines, tank storage and secondary containment. He has 25 years of experience in various leadership roles, encompassing industrial sales, business development, marketing and product management.

For decades, the oil and gas industry has viewed corrosion in storage structures as a major cause of discharges and tank failure. In order to protect their assets and extend the life of their tanks, owners typically include some method of corrosion control.

Corrosion is defined as the gradual destruction of materials or their properties due to a reaction with their environment. Affected mediums include metals, plastics and other materials that are incompatible with certain chemical compounds. The useful properties of materials and structures, including strength, appearance and permeability to liquids and gases, can all be degraded by corrosion. One way to combat this is by protecting the structure with a high-performance coating.

Many high-performance coatings offer tremendous resistance against corrosion and abrasion. But there are fewer specialized coatings that provide chemical resistance for strong liquids — such as acids, alkalis, gases, solvents or oxidizers — as well as extreme temperatures and other factors associated with the storage and transportation of those liquids.

It is essential that the interior as well as the exterior of metal tanks be protected. In addition to the environmental factors that can cause corrosion of the steel, there are many types of products stored inside the tanks that can accelerate the breakdown of the surface. If the structure is not appropriately protected, then perforations can occur, causing consequential damage to the interior. The cost implications can be felt directly and indirectly by the owner through loss of production, environmental impact and required damage repair.

In order to provide the most cost-effective corrosion protection that will perform as needed, it is imperative the right criteria



ChemLine® is used to line the interior of tanks that house a wide range of aggressive chemicals and liquids.

be considered when selecting a coating. If an appropriate coating is not chosen and applied, contamination of the stored product and deterioration of the tank become more likely.

CHOOSING A TANK LINING FOR SPECIFIC SERVICES

When storing hazardous bulk liquids, the key question to ask is whether the tank lining can handle the corrosive attack of the chemical. Will the lining be reliable over time, maintaining both the integrity and purity of the chemical stored, while also preserving the tank asset? Here, Advanced Polymer Coatings, Inc. (APC), manufacturer of the polymer-based ChemLine® coating system, offers a few case histories where careful analysis and coating selection were critical to success.

Hydrochloric Acid Storage

Viking Chemicals, a global service company engaged in oil-and-gas drilling and related services, turned to Turkish tank manufacturer Cazgir Makina and the experts at MarineLine Turkey for a storage tank lining solution to safely carry corrosive hydrochloric acid (HCl).



This Viking Chemicals tank (top) was destined for future HCl storage. (Below) First, the existing dirty, greasy epoxy lining needed to be blasted and removed, and then the tank was chemically cleaned and prepped. (Bottom) Once the tank was totally clean, it was lined with two coats of ChemLine® to deliver a protective solution for storing corrosive HCl.

A Viking tank that had been storing dirty petroleum products (DPPs) was lined with an epoxy coating. It had never held HCl, which would not be possible with the epoxy coating. Viking wished to avoid using rubber lining, which is expensive to apply and both difficult and costly to repair.

The specification called for refurbishing this existing 150-cubic-meter tank with APC's ChemLine® coating, a system that works well in extreme service conditions. The patented polymer in its formulation creates a highly cross-linked, virtually non-permeable barrier lining between the chemical and the underlying steel substrate where corrosion can occur.

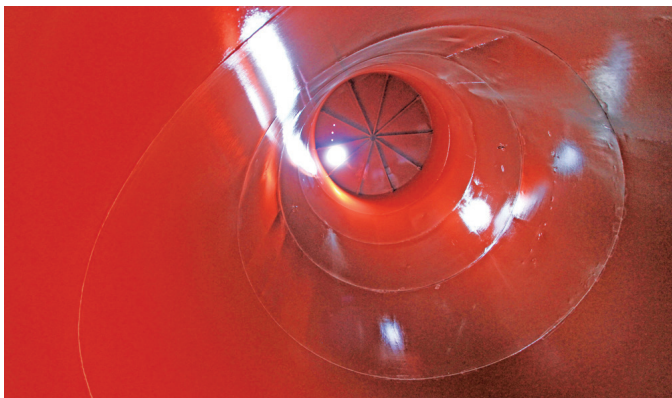
This tank underwent a complete surface renovation to remove the existing epoxy lining from the internal tank surfaces that had layers of dirt and greasy build-up from past DPP storage. Once the tank was clean, a ChemLine® coating application was done in two coats — first, a gray base coat at 7 to 8 mils, followed by a 7-to-8-mil red-colored topcoat to prevent any discoloration from the HCl. The coating was heat cured at 177 C for 8 hours to enhance cross-linking of the polymer, and then it was put into service.

After a successful year, Viking asked for a second newbuild HCl tank to be coated with the ChemLine® system, followed by the coating of a third newbuild tank, currently in progress. The first two tanks have been in service for several years with no problems.



Fatty Acid Distillates Storage

At AVES, one of the largest edible oil producers in Turkey, ChemLine® is being used as a lining in four carbon steel tanks (a total of 1,000 square meters) which store fatty acid distillates at ambient temperature. This follows a previously completed order for 14 carbon steel storage tanks at the facility, also lined with the ChemLine® system.



The inside of the AVES tanks are coated with the unique ChemLine® tightly cross-linked polymer coating technology. This ensures a virtually non-permeable surface — ideal for holding edible oils.

Sulfuric Acid Storage

Several tanks at the Monómeros Colombo Venezolanos terminal storage facility in Barranquilla, Colombia, required a special lining to handle sulfuric acid. The company requested ChemLine® lining because it could offer high-purity storage while also protecting against

tank corrosion. These carbon steel tanks hold a sulfuric acid concentration of 98.5 percent at an average temperature of 40 C (104 F), operating at a peak temperature of 80 C (176 F). The company reports that the coating has provided excellent chemical resistance since it was installed four years ago.

MEG and Sulfuric Acid Storage

At the Likit Kimya facility in Adana, Turkey, two new storage tanks have been constructed to store mono ethylene glycol (MEG) and another to store sulfuric acid. Each of these carbon steel tanks is 21 meters high by 14 meters wide and designed to hold 3,000 cubic meters of liquid. All tanks are currently in full service, delivering good chemical resistance.



(Top) At Likit Kimya, these tanks were prepped for MEG storage. (Bottom) Two coats of ChemLine® were applied in these storage tanks — first a red basecoat followed by a gray topcoat, as shown in this close-up view.



Proprietary Polymers and Chemical Storage

At the Kraton Formosa Polymers Corporation (KFPC) in Taiwan, a number of specialty polymers are stored and mixed in carbon steel tanks to manufacture hydrogenated styrenic block copolymers, ethylene and other chemicals. These vessels operate at temperatures between 60 C to 120 C.

KFPC asked to line four new vessels with ChemLine® for protection against the contained chemicals and corrosion. The tanks were prepped by grit-blasting the interiors, followed by a ChemLine® basecoat, a stripe coat, then a topcoat. Both the basecoat and topcoat were applied at 7 to 8 mils, for a total thickness of the 12-to-14-mil system. Following application, the coating was heat cured at 121 C (250 F) for 6 hours. The vessels have been in service at the facility and are operating as expected.



A new carbon steel vessel (top) is shown waiting for lining at KFPC in Taiwan. Spark testing of the finished ChemLine® topcoat (bottom) is done to prepare for storage of different proprietary polymers and specialty chemicals.

USING TEST DATA TO ENSURE CONFIDENCE

APC studies each customer chemical resistance request to ensure ChemLine® coating will perform for that tank service. If approved, a lab technical report is issued confirming the lining should be able to handle that need.

To support these studies, APC relies on thousands of in-house and independent tests conducted to show the ChemLine® system's performance with a wide range of hazardous and aggressive chemicals and liquids, such as 37-percent hydrochloric acid, 98-percent sulfuric acid, waste acids, acetic acid, caustic soda, solvents, alkalis, CPPs and edible oils. In these tests, ChemLine® was found to resist chemicals from pH 1 to pH 14 and at elevated temperatures. Chemicals approved for use with the coating system are highlighted in the ChemLine® Chemical Resistance Guide at www.adv-polymer.com

ChemLine® high-solids/low-VOC coatings can be applied via conventional airless spray equipment as a two-coat system or as a one-coat plural-component system. When cured, the coatings deliver a highly chemical-resistant, hard, smooth surface inside the tank.

CONCLUSION

To ensure greater flexibility in the range of chemicals that can be handled by one tank, it is wise to consider a universal lining. Extensive testing and years of field service have shown that the ChemLine® system protects tanks against more types of chemicals and environmental influences than stainless steel, phenolic epoxies and other conventional coatings.

Avoiding the need to recoat while preserving the integrity and longevity of the tanks — as well as the purity of the contained chemicals — can save tens of thousands of dollars in labor, materials and repairs.