

## FEATURED PROJECT

# Composite Tank Roof Repair

## REINFORCEMENT OF HYDROCHLORIC ACID TANK

### CUSTOMER

Dallas Chemical Plant

### APPLICATION TEAM

Cameron Industries

### SYSTEM

Carbon Fiber Composite Tank Reinforcement

### LOCATION

Texas City, TX

### DATE OF APPLICATION

August 2019

### SUBSTRATE

Carbon Steel

### PROBLEM

An inspection of the roof of a hydrochloric acid tank at a chemical manufacturing company revealed several through-wall failures. Traditional weld repair options were implausible as the roof was coated internally, had several injection ports and other interruptions present. Due to this and the desire to minimize the impact on production, an external repair while the tank was online was deemed appropriate. The repair needed to withstand constant exposure to hydrochloric acid vapor and have a UV-stable topcoat. As the full extent of corrosion was unknown, an engineering analysis was necessary to ensure the structural integrity of the tank.



Figure 1 Tank Roof Before Composite Repair

After a detailed finite element analysis was performed to ensure that the roof had sufficient structural strength, the plant opted for a high-strength, acid-resistant, carbon fiber reinforcement system as a repair solution. The system was chosen as it would be installed on the exterior of the roof, eliminate hydrochloric acid leaks, and prevent external corrosion.



Figure 2 Carbon Fiber Installation on Tank Roof

Installation Steps:

1. The surface was grit blasted and primed with HP-400 Novo for maximum adhesion.
2. Pits, weld seams and through-wall failures were prepared for composite wrapping by using FRP Repair Putty.
3. Three layers of a high-strength, aerospace-grade carbon fiber composite was saturated with an acid-resistant epoxy, FRP 220-C.
4. After the composite cured, a UV-resistant urethane topcoat was applied.

Though the tank was brought offline for a limited time during the repair, the entire repair was installed and fully cured well within the planned repair window. This was done at a fraction of the cost of replacing the tank roof and with minimal impact on production.



Figure 3 Final Repair After Urethane Topcoat

### SOLUTION

### BENEFITS

- The plant eliminated all leaks in their Hydrochloric Acid tank roof.
- Installation was completed quickly in a limited tank outage schedule.
- The entire system is resistant to concentrated hydrochloric acid, ensuring a long-term, maintenance-free solution.
- The composite repair provides greater than 3,000 psi adhesion to blasted steel, ensuring that acid will not undercut the system.