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FEATURED PROJECT

Underground Power Transmission Lines

CUSTOMER
Power Transmission System Operator

LOCATION
New York, NY

APPLICATION TEAM
Various

DATE OF APPLICATION
May 2019

SYSTEM
Carbon Fiber Pipe Reinforcement

SUBSTRATE
Carbon Steel

PROBLEM

A major regional power transmission systems operator found the traditional methods of leak repair and reinforcement of their underground high-pressure, fluid-filled (HPFF) transmission cable system was not keeping up with the level of corrosion present in their system, impacting the availability of service to millions of customers. Many of these pipe-type cables have been underground for more than 50 years, well past the service life of the protective coating on the pipe exterior. Even with a sophisticated cathodic protection system in place, stray current from other critical infrastructure was accelerating the corrosion of the HPFF cable system.

Figure 1 Typical Corrosion Found

SOLUTION

After meticulous research and development and several pilot projects following the rigorous client's standards, Advanced FRP Systems moved forward with the carbon fiber composite system to repair critical areas of the transmission system. The composite system was chosen for several reasons:

1. The repair could be performed with the system online.
2. The solution is compliant with ASME PCC-2 (2015) Non-Metallic Composite Repair Systems: High-Risk Applications.
3. The composite repair solution does not require welding or other hot work.
4. The composite is non-metallic and provides an excellent corrosion barrier to eliminate further corrosion.

Figure 2 Installation of CF Composite

Over six months, six layers of high-strength, aerospace-grade carbon fiber composite were applied over 6,000 linear feet of pipe. The application included the identification of 3 ft. adhesion zones every 100 linear feet of pipe that were grit blasted to SSPC – SP 10 standards and allowed the composite to adhere directly to the pipes. The pipe sections between adhesion zones were then encapsulated by the structurally independent composite system.

Figure 3 After Installation

BENEFITS

- The adhesion zone concept reduced required surface preparation by about 90% which significantly saved time and labor and reduced cost
- This repair solution will provide the operator with a maintenance-free service life of over 50 years.
- The composite system is fully structural, verified to withstand more than 1,000 psi of internal pressure with a through-wall failure in the host pipe.