NEETRAC
National Electric Energy Testing, Research, and Applications Center

NEETRAC NEWS

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In This Issue...

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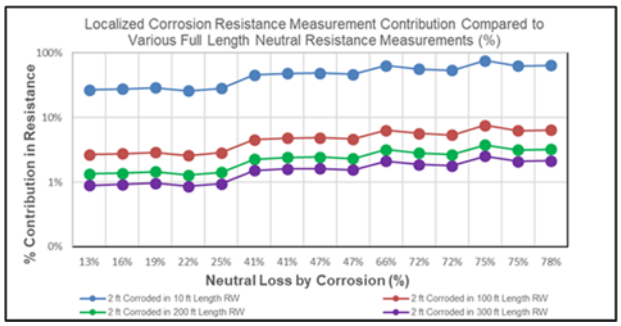
Baseline Projects Recently Completed

The following Baseline project closeouts were presented at the January 2023 Management Board Meeting. The reports will be finalized and distributed to eligible Members in the coming months. In the meantime, please contact the project PI listed below for more information.

Impact of Neutral Corrosion on Service Reliability of Jacketed Cable Systems

Baseline Project Number 16-190
PI: Anil Poda, anil.poda@neetrac.gatech.edu

Forensic evaluations of extruded dielectric cables at NEETRAC often show substantial corrosion of the cable metallic shield (neutral) even though the cable may be jacketed. The corrosion appears to be the result of moisture migration between the jacket and the cable core insulation shield. The purpose of this project was to better understand moisture migration under extruded cable jackets, assess the fault performance of corroded neutrals, and assess the effectiveness of detecting corroded neutral segments using resistance measurements.

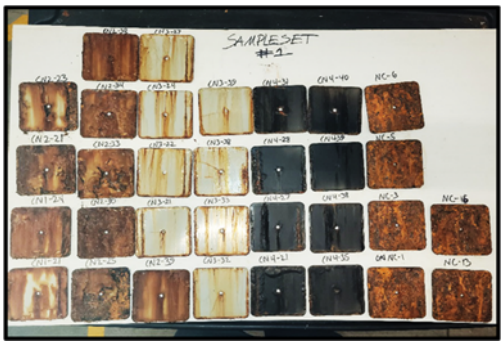


Water penetration tests indicated that water can readily penetrate cables, and sometimes joints, depending on the cable and joint designs and the conditions. Post-corrosion test evaluations suggested that although a corroded neutral may still be continuous, the increased resistance in the corroded area or section can adversely affect neutral performance, particularly its ability to carry fault current. Tests also showed that the jacket of cables with corroded neutral segments may ignite under some fault conditions. Additionally, traditional methods for neutral resistance measurements may not be a reliable means of assessing neutral corrosion for long cable lengths. Both round wire and flat strap concentric neutrals were tested and found to perform differently in both the corrosion mechanism and post testing.

Coating Evaluation Program

Baseline Project Number 18-060

PI: Tristen Cline, tristen.cline@neetrac.gatech.edu

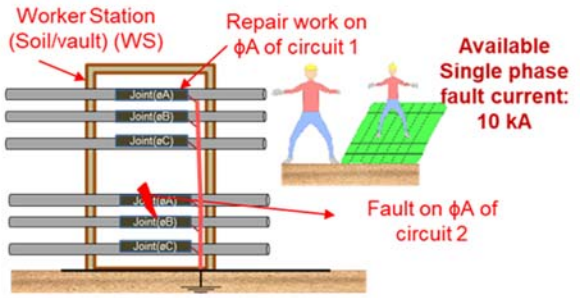


With many steel transmission and distribution structures dating back into the 1960s or earlier, corrosion repair needs are increasing. Previous NEETRAC research discovered that several utilities have restarted painting programs to remediate and prevent corrosion, but there remain questions about which coating systems are most effective. This project evaluated four (4) Member selected above-grade coatings for transmission towers. In the initial work, it was discovered that uniform film thicknesses of the coatings to the manufacturers' specifications were not achievable with standard paint roller application. For repeatability of laboratory results, a film applicator was utilized for coating application on the carbon steel test coupons. The coatings were evaluated through a cyclic corrosion program involving UV exposure (ASTM G154), salt fog (ASTM B117), and thermal cycling (ASTM D6944). The performance of the four coatings were evaluated using the following assessments: scribe creepage (Ford B196), adhesion (ASTM D4541), and wear resistance (ASTM D4060). Coatings were ranked using the following categories: yield rate, scribe creepage, adhesion effect size, abrasion effect size, adhesion values (post conditioning), abrasion values (post conditioning), and cost. Overall, two-part coating systems performed better, with significantly higher yield rates. For single-part systems, one coating system performed better in every category. The two-part systems had similar rankings to each other, and no strong conclusions could be drawn.

Developing Insights into Cable System Worker Safety Challenges

Baseline Project Number 20-164

PI: Anil Poda, anil.poda@neetrac.gatech.edu



This project supported model development and simulation of worker conditions during repair work on de-energized cable systems. In 2014, OSHA revised / clarified regulations that applied to working on cable systems. The changes require that an equipotential zone (EPZ) be established at the worksite. If an EPZ is impractical, work without grounds is allowed provided that lines are de-energized, there is no possibility of contact with an energized source, and the hazard of induced voltage is not present. Utilities are required to perform an engineering analysis to ensure that alternate work methods will prevent employees from being exposed to hazardous differences in electric potential. Participating Members supplied three different underground cable system case studies involving a single-phase loop circuit, a three-phase loop circuit, and two parallel circuits located adjacent to each other in radial line configurations. These case studies were then simulated using the WinIGS software platform. For each grounding scenario, the worker was assumed to be repairing a broken conductor on the primary system at the worksite. The main focus was to identify the risks associated with exposure voltages while using Equipotential Zones (EPZs) versus no-EPZs based on various bonding configurations at the worksite with a bracket grounding technique. A risk matrix was developed for each case study to help utilities understand their worker exposure voltages, including the use of PPE (gloves) with different weather conditions and potential mitigation solutions. The individual case studies used soil models to represent different worksite conditions (direct-buried / vault) and data from NEETRAC project 17-205 supplied modern PPE resistance values. In addition to worker safety, general public / work zone safe distances were also calculated for the various fault scenarios in each case study.

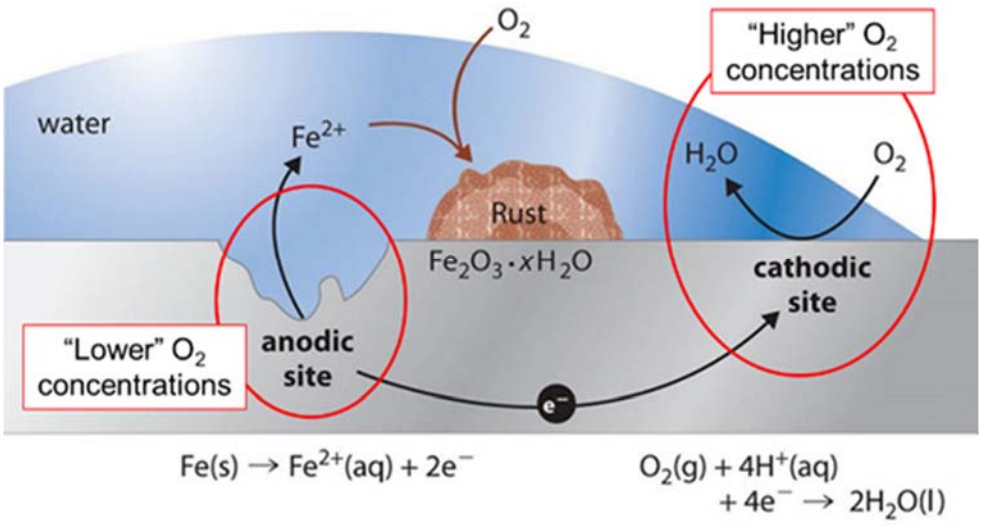
Baseline Projects Recently Completed - Cont'd

Understanding Utility Component Corrosion

Baseline Project Number 19-079

PI: Joe Goldenburg, joe.goldenburg@neetrac.gatech.edu

Corrosion is an extremely broad topic that depends on materials, wildlife, geography, geometry, and more. A comprehensive understanding of corrosion requires an interdisciplinary approach involving material science, chemical engineering, mechanical engineering, microbiology, and economics. The project closeout includes the cost, provider, and course curriculum of corrosion training from industry recognized leaders. The training courses will introduce utility engineers to basic corrosion mechanisms, economics, remediation, and prevention. Additionally, an executive level "About Corrosion" presentation reviewed corrosion basics using Member submitted examples. The presentation included chemical processes, categorization, and mitigation methods.



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Management Board Meetings

The next three Management Board meetings have been scheduled for the following dates:

May 17 - 18, 2023

September 19 - 20, 2023

February 7 - 8, 2024

For details, please visit the Member Section of the NEETRAC website at www.neetrac.gatech.edu.

2022/2023 NEETRAC Member Management Board Representatives

1. Aluma-Form…….. Pete Landsgaard
2. Ameren…… John Crotty
3. American Electric Power…….. Jim Salerno
4. BC Hydro……Hudson Giesbrecht
5. Borealis Compounds, Inc.……..Susan Song
6. Conductores Monterrey…… Raul Garcia
7. Consolidated Edison…… Frank Doherty
8. Dominion Energy…….. Liz Sullivan
9. Dow ……..…….. Paul Caronia
10. DTE Energy……Abdalla Sadoon
11. Duke Energy……...Chris Fletcher
12. Eaton…….. Alan Yerges
13. Exelon…… Lisa Perrone
14. FirstEnergy……..Randy Coleman
15. Gresco Utility Supply……..Brad Schafer
16. Hubbell Power Systems……Charles Worthington
17. LS Cable & System……Tim West
18. Nova Scotia Power……Jim McFadgen
19. NRECA……Reed Cooper
20. Okonite……...Bill Crawford
21. Pacific Gas & Electric…….. Jim Gill
22. PPL Corporation……..……Adam Eshleman
23. Prolec GE…….. Carlos Gaytan
24. Prysmian Group……Jared Weitzel
25. Public Service Electric & Gas…... Ed Gray
26. Rauckman Utility Products……Jim Rauckman
27. S&C Electric…….. Tim Qualheim
28. San Diego Gas & Electric……..… Kevin Galloway
29. Slacan Industries……..Ian Pollock
30. Smart Wires…… Haroon Inam
31. Southern California Edison……Alan Kasanow
32. Southern Company…….. Susan White
33. Southern States, LLC…….. Steve Fan
34. Southwire Company……... Yuhsin Hawig
35. Tacoma Power……..Joe Rempe
36. TE Connectivity……Brian Ayres
37. TVA…… Steven Coley
38. WEC Energy Group…….. Michael Smalley